MEMORANDUM RE PROGRESS

In addition to the Nipigon System enquiries have been begun into the following systems

(a) Eugenia

(b) Central Ontario

(c) Guelph Radial Railway

(d) St. Lawrence

In addition the following special topics have been taken up,

Insurance

Rural Lines

Clean-up Deal.

In the case of each of the individual systems a brief has been prepared indicating lines of enquiry and plans for public hearing.

In addition to the work on individual systems and particular topics, I have been at work on the general outline of the facts concerning the Hydro Electric Power Commission, its methods of finance, administration and its relations to the Provincial Government and to the municipalities.

Under this general head the following topics have been taken up

MEMORANDUM ON TRADERS

In addition to the Pigeon System equipment have been taken into the following systems

(a) Navajo

(b) Central Ontario

(c) Quebec Radial Railway

(d) St. Lawrence

In addition the following special tools have been taken up:

Lanterns

Rural Lines

Clean-up boat.

In the case of each of the individual systems a brief has been prepared indicating lines of enquiry and plans for public meeting.

In addition to the work on individual systems and particular topics, I have been at work on the general situation of the Industrial and the Pigeon Electric Power Corporation, the problems of finance, administration and its relations to the provincial government and to the municipalities.

Under this general head the following topics have been taken up:

Status and capacity of Hydro-Electric Power Commission

FINANCIAL RELATIONS

Methods of Obtaining Money

(1) From Government
- (a) Appropriation
- (b) Special Warrant
- (c) Treasury Board Minutes

(2) Borrowing on Security of Debentures of the Commission
- (a) Guaranteed by the Province
- (b) Not guaranteed by the Province
- (c) Guaranteed by the Province and supported by underlying bonds of the municipality

(3) Borrowing without the security of Debentures.

(4) Profits made on Trading Account.

Misappropriations

Comptroller

Repayment

Interest

Sinking Funds

Deferment of Charges

Renewals

Contingencies

Power at Cost

Acquisition of Property by assumption or guarantee of Indebtedness

Rates

Method of Determining

Status and security of Hydro-Electric Power Commission

FINANCIAL RELATIONS

Methods of Obtaining Money

(1) From Government
  (a) Appropriation
  (b) Special Warrant
  (c) Treasury Board Minutes

(2) Borrowing on Security of Debentures of the Commission

  (a) Guaranteed by the Province
  (b) Not guaranteed by the Province
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Misappropriation

Comptroller

Repayment

Interest

Sinking Funds

Deferment of Charges

Renewals

Contingencies

Power as Cost

Acquisition of Property by exemption or guarantee of Indebtedness

Rates

Method of Determining

Factors Involved

Complaints

Supply from one System to others

CONTRACTUAL AND STATUTORY RELATIONS WITH MUNICIPALITIES

General Commentary on the capacity of the Commission to contract and the Capacity in which it contracts

Question of Enforceability

Contracts between the H.E.P.C. and Municipalities

Summary and Abstract of all such contracts

Comparison of Hydro contracts with those in use among Private Power Companies

Flat Rate contracts and Bonussing between Municipalities and Consumers

This general topical sketch is not yet complete. It would in any case be amplified and enriched from time to time as examples were gathered in the course of our investigations into the particular systems, but I had hoped the Commission would consider the incomplete work as it stands and indicate along what lines it should be carried out. My object in this general statement in the meantime has been to set out the known facts as a basis for such observations and findings as the Commission might care to

Factors Involved

Complaints

Supply from one System to others

CONTRACTUAL AND STATUTORY RELATIONS WITH MUNICIPALITIES

General Commentary on the capacity of the Commission to contract and the Capacity in which it contracts

Question of Interconnectivity

Contracts between the H.E.P.C. and Municipalities

Summary and Abstract of all such contracts

Comparison of Hydro contracts with those in use among Private Power Companies

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make thereon. The work so far, while brief in form, represents several months of investigation on the part of myself and my assistants. I take it that it is important that we should know whether we are proceeding on right lines before spending more time on it.

In addition to the topical sketch of relations between the Hydro Electric Power Commission and the Province above referred to which comprehends a history of the legislative development of the Power Commission Act, there has also been considerable research into the origin and development of the Hydro Electric movement. Considerable investigations have been made into the origin and development of the Queenston-Chippawa enterprise, and in this connection studies have been made of the franchises of private companies at Niagara Falls and of the riparian rights to the waters of the Niagara River.

It seems to me that it is now possible to itemize the criticisms, whether well founded or otherwise, against the Hydro Electric Power Commission, as follows:

I- That the Commission has been over anxious to extend its jurisdiction.

2- That in exercising its powers the Commission has been oppressive and unjust to other interests.

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It seems to me that it is now possible to formulate the criticisms, whether well founded or otherwise, against the Hydro Electric Power Commission, as follows:

1- That the Commission has been over anxious to extend its jurisdiction.

2- That in exercising its powers the Commission has been oppressive and unjust to other interests.

3 - That in carrying out its object the Commission has been lacking in frankness with its principals, the municipalities.

4 - That the Commission has been impatient at checks and has disregarded legal restraints.

5 - That the Commission has used its power and influence oppressively against private interests, municipalities and even the Government.

6 - That the Commission has shown partiality and discrimination in its dealing with the municipalities.

7 - That the Commission has shown inefficiency in such matters as the preparation of estimates and the control of waste and extravagance.

8 - That the Commission has shown the same monopolistic tendencies as are sometimes attributed to private concerns.

It is important that the Legal Departments should have some direction as to the relative importance of these different counts. I have had reason to doubt, for example whether the Commission considered it discreditable to the

3 - That in carrying out its object the Commission has been lacking in frankness with its principals, the municipalities.

4 - That the Commission has been impatient at checks and has disregarded legal precedents.

5 - That the Commission has used its power and influence superficially without private interests, municipalities and even the Government.

6 - That by combining the above particularly the administrative in its dealing with the municipalities.

7 - That the Commission has shown inefficiency in such matters as the preparation of estimates and the control of waste and extravagance.

8 - That the Commission has shown the same monopolistic tendencies as are sometimes attributed to private concerns.

It is important that the Legal Department should have some direction as to the principal controversies of legal different results. I have had reason to doubt, for example whether the Commission considered it discreditable to the

Commission that it was partial in its treatment of municipalities not connected with the Hydro Electric System. If, for example, it should not be thought reprehensible for the Commission to show favoritism as between Cornwall and Brockville it was no important that evidence bearing on that point should be followed up.

On these different points the evidence, documentary and otherwise, is liable to take us very far afield, the number of files and documents to be examined is very large, and it is important that our time should not be wasted in following matters that will not be of value in result.

I would request that the Commission consider the criticisms enumerated above and give definite directions as to the programme of work for the balance of this year. One question is, whether it is intended to have reports on Central Ontario, Eugenia and Guelph gotten out before other systems such as Wasdells, Severn and Rideau are taken up. In this connection, I think it should be considered whether the Guelph situation should be taken by itself or as an item in the general

Commission that it was partial in its treatment of municipalities not connected with the Hydro Electric System. If, for example, it should not be thought reprehensible for the Commission to show favoritism as between Cornwall and Brockville it was no important fact that municipal ownership should be believed in.

In their historical pamphlet on Ontario, Lucas, Shortt and Keefer, by limits to take at very the article, the number of files and documents to be examined is very large, and it is important that our time should not be wasted in following matters that will not be of value in result.

I would request that the Commission consider the relations commercial where and also advisable to visit the principal towns at which the hearings of this year. One question is, whether it is intended to have reports on Central Ontario, Muskoka and Georgian Bay and Lake Ontario and other various ways as Kingston, Barrie and Gilmour are known to. In this connection, I think it would be satisfactory to the people if some steps should be taken by itself or as an item in the general

policy of Railway development. In connection with Eugenia, it seems to me that the three systems of Eugenia, Wasdell and Severn, with Muskoka, perhaps, added might be considered together. There is also the question whether the rural lines should be dealt with separately or as adjuncts of the different systems.

It requires, in each case, several weeks' work on the documents and files to prepare a preliminary brief for a public hearing. For this reason it is desirable that we should know some weeks in advance what the programme is to be.

Respectfully submitted.

T O P I C A L A N A L Y S I S

The following will serve -

(a) As a Topical Analysis of the subjects to be considered by the Commission;

(b) As a skeleton upon which the report of the Commission might be based;

(c) As an index for the filing of data.

The sketch is susceptible of variation according to the purpose for which it is to be used.

It is also susceptible of expansion according as further topics may be taken under consideration.

The primary division is into

A. General

B. Engineering

C. Accounting

Topics which may be taken up under the head of "Engineering" or "Accounting" may be deleted from the "General" head.

The findings or recommendations of the Commission might be set down under each topic or reserved for a separate section.

5 10 15 20 25

A. GENERAL

1 HISTORY

(a) Stage of Development of Electric Power Transmission in Ontario in 1902.

(b) Circumstances giving rise to original scheme of Hydro-Electric System

(c) Franchises of Private Companies at Niagara Falls.

(d) International Treaties controlling Water Supply:
Burton Act,
International Waterways Commission.

(e) Initiation of Hydro-Electric Scheme.

(f) Early Estimates of Demands for Power.

(g) Early Engineering Reports.

(h) Political History

(i) History of Early Legislation

(j) Hydro-Electric Power Commission Act, 1906-
General Scheme of Act.

(k) Appointment of Permanent Commission.

(l) History of Construction of Niagara Transmission System:
Original Plan,
Changes,
Extensions.

(m) Administration during Construction Period.

(n) Relations with Generating Companies.

(o) Effect of Hydro-Electric System on Vested and other Private Interests:
Expropriation,
Private Systems,
Contests with Adverse Interests.

(p) Growth and Development of Niagara System.

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(q) Acquisition of Ontario Power Company -

Circumstances leading to acquisition,
Acquiescence of Municipalities,
Method and terms of acquisition,
Authority for acquisition,
Ownership of Property,
Responsibility for indebtedness,
Prospects of Liquidation,
Relation to Chippawa Development,

Construction of Third Pipe Line:-
Circumstances leading to construction,
Authority for construction,
Permanency of work,
Appropriation for payment,
Amortization of cost,
Effect on cost of power,
Justification for undertaking.

(qq) The Queenston-Chippawa Development -

Earlier discussions of Project,
Circumstances leading to undertaking,
History of undertaking:
Changes in scope of undertaking,
Estimates.
Acquiescence of Municipalities:
In original scheme,
In enlargements of scheme.
Relation of Government to undertaking,
Authority for undertaking,
Authority for extension
Justification,
State of completion,
Present output,
Present demands,
Estimate of future demands.

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Estimate of future capacity,

Probable total cost:-

(a) for installation of three units
(b) " " " five "
(c) " " " nine "

Scheme of amortization,

Probable cost of power.

(r) Thorold System -

Description,

History of acquisition,

Relation of H.E.P.C. to System,

Relation of municipalities to System,

Disppsition of Profits,

Provision for sinking funds.

(s) Essex System -

Description,

History of acquisition,

Relation of H.E.P.C. to System,

Relation of municipalities to System,

Relation to Niagara System,

Burden of losses,

Provision for sinking funds.

(t) Central Ontario System -

Description,

History of Acquisition,

Relation of H.E.P.C. to System,

Relation of Municipalities to System,

Analysis of different Undertakings and results to date,

Responsibility for success of System,

Responsibility for Indebtedness,

Future disposition of System,

Provision for Sinking Funds.

(u) Bonne Chere River Storage System (Renfrew System)-

Description of System,

History of Construction,

Relation of H.E.P.C. to System,

Relation of Municipalities to System,

Relation of Municipalities to System,

Responsibility for System,

Provision for Sinking Funds,

Provision for Losses,

Future disposition of System.

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(v) Thunder Bay System -

Description of System,

History of System,

Appropriations for Construction,

Responsibility for Nipigon Development,

Relations of Pt. Arthur and Ft. William to System,

Equality of Rates as between Port Arthur and Fort William,

Negotiations with Great Lakes Paper Co.,

Administration of local distribution system,

Provisions for Sinking Funds,

Amortization of Cost,

Responsibility of Municipalities for Cost,

Responsibility of Government for Cost.

(w) Severn System -

Description of System,

History of System,

Relation to Wasdell System and Eugenia System,

Ownership of System.

(x) Wasdell System -

Description,

History,

Provision for Sinking Fund,

Responsibility for Construction

Disposition of Losses

Relation to Severn System.

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(y) Ottawa System -

Description,

History,

Relation of H.E.P.C. to System.

(z) Rideau System -

Description,

History,

Relation of H.E.P.C. to System.

(aa) Muskoka System -

Description,

History,

Relation of H.E.P.C. to System.

(bb) Eugenia System -

Description,

History,

Relation to Severn System.

(cc) Sandwich, Windsor & Amherstburg Railway, including Windsor & Tecumseh El. Rly. Co.,

(dd) Port Credit-St. Catharines Railway,

(ee) Toronto-Port Credit Railway,

(ff) Toronto & Eastern Railway

5 10 15 20 25

(gg) Hamilton, Galt, Elmira & Guelph Railway.

(hh) Hamilton, Brantford, Woodstock & London Ely.

(ii) St. Catharines & Niagara Falls Railway.

(jj) Niagara, St.Catharines & Toronto Railway, including Toronto Suburban Railway.

(kk) Guelph Railway.

2 DEVELOPMENT OF HYDRO-ELECTRIC POWER COMMISSION

Political.

Statutory.

Financial.

Commercial.

3 PRESENT ORGANIZATION OF HYDRO-ELECTRIC POWER COM.

Executive Officers,

Engineering Department,

Accounting Department,

Treasurer's Department,

Secretarial and Legal Department,

Inspection Department and Laboratory,

Merchandising,

Insurance; Salaries.

5 10 15 20 25

4 POWERS OF HYDRO-ELECTRIC POWER COMMISSION

As Trustee,

As Owner,

As a Judicial Body.

5 ACTIVITIES AND FUNCTIONS OF H. E. P. C.

Transmission of Power,

Generating of Power,

Construction of Transmission Lines,

Construction of Generating Plants,

Inspection,

Merchandising of Supplies,

Hydrographic Surveys,

Advising Municipalities on Water Supply,

Trustee for Municipalities

Wholesaler of Power

Retailer of Power,

Owner of Works and Transmission Lines,

Holding Stock in Companies,

Operating Railways,

Operating Gas Plants,

Operating Pulp Mill,

Operating Farms,

Promoting Railways,

Controlling Rates;

of Municipalities,
of Private Companies.

5 10 15 20 25

6 RELATION OF H. E. P. C. TO GOVERNMENT

Powers of Commission,

Relation to Executive Council:
-In Law
-In Practice,

Fiscal Relation,

Responsibility for Expenditure:
-To the Government
-To the Municipalities.

Authorization of Expenditure:
-Exceeding appropriations,
-Ear-marking appropriations.

Methods of Check and Control

Relations of Auditors to:
(a) The Government
(b) The Commission
(c) The Municipalities.

Comptroller.

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7 RELATION OF H. E. P. C. TO MUNICIPALITIES

Representation on Commission,

Representation in Legislature,

Ontario Municipal Electric Association,

Ontario Radial Association,

Propaganda,

Position as Trustee

Control of Expenditures

Control of Rates,

Auditing of Accounts

Control of Financial Policy:
-Sinking Funds
-Reserve for Renewals
-Deferring Operating Charges.

5 10 15 20 25

3. ENGINEERING

5 10 15 20 25

8. ACCOUNTING

HYDRO-ELECTRIC INQUIRY COMMISSION

REPORT OF SECRETARY

Below is presented a sketch of the different systems of departments under the management of the Hydro-Electric Power Commission at the present time. This sketch is designed to show briefly in outline:-

(a) The number and variety of the undertakings conducted by the H. E. P. C.

(b) The various circumstances giving rise to the undertaking and the Commission's participation in it.

(c) The relations in which the Commission stands to the various undertakings.

(d) The various capacities in which the Commission acts

(e) The relation of the Commission to the constituent municipalities on the one hand and to the Province on the other.

The undertakings at present comprised within the scope of the Hydro-Electric Power Commission consist of some twenty-four systems or units in various stages of development, some being still in the promotion stage. Chronologically these systems would range themselves as follows:-

1. Niagara Transmission Line, projected in 1906, commenced operation in 1910.
2. Ottawa System (1907)
3. Port Arthur (1910) and Thunder Bay (1911) Systems
4. Severn System (1911)
5. Wasdell System (1912)
6. St. Lawrence System (1912)
7. Bonne Chere Water Storage System (1913)
8. Eugenia System (1914)
9. Muskoka System (1915)
10. Central Ontario System (1916)
11. Chippawa-Queenston Development (1917)
12. Ontario Power Company (1917)
13. Rideau System (1918)
14. Essex System (1918)
15. Thorold System (1918)
16. Sandwich, Windsor & Amherstburg Ry. (1920)
17. Guelph Radial Railway (1920)

For the purposes of description and discussion the systems may more conventently be taken in the following order;

1. Niagara Transmission System.
2. Ontario Power Company.
3. Chippawa-Queenston Development
4. Thorold System
5. Essex System
6. Central Ontario System
7. Bonne Chere Water Storage System
8. Port Arthur and Thunder Bay System.
9. Severn System
10. Wasdell System
11. Ottawa System
12. Rideau System
13. St. Lawrence System
14. Muskoka System
15. Eugenia System
16. Sandwich, Windsor & Amherstburg Ry. including Windsor & Tecumseh Electric Ry. Co.
17. Port Credit - St. Catharines Railway.
18. Toronto-Port Credit Railway
19. Toronto & Eastern Railway
20. Hamilton, Galt, Elmira & Guelph Railway.
21. Hamilton, Brantford, Woodstock & London Railway.
22. St. Catharines & Niagara Falls Railway.
23. Niagara, St. Catharines & Toronto Railway, including Toronto Suburban Railway.
24. Guelph.

Niagara Transmission System

This system was first projected by certain manufacturers of Berlin, now Kitchener, in 1902 as a co-operative municipal undertaking. After various plans of organization had been discussed amongst the promoters and with the Government an Act was passed by the Ontario Legislature in 1906 authorizing the appointment of a commission entitled "The Hydro-Electric Power Commission of Ontario", consisting of three members, with power to transmit and deliver electric power to such municipalities as might enter into contracts duly sanctioned by by-laws assented to by the electors. In pursuance of this and the revised Act, passed in 1907, the following nineteen municipalities entered into contracts with the Commission;

Toronto
Hamilton
London
Brantford
Guelph
Stratford
St. Thomas
Woodstock
Ingersoll
Berlin
Galt,
Toronto Junction
Hespeler
St. Marys
Preston
Paris
Waterloo
New Hamburg
Weston

The original Act of 1906 empowered the commission to generate as well as transmit power, but instead of proceeding to develop a generating plant the Commission entered into a contract with the Ontario Power Company by which that company agreed to deliver at Niagara Falls up to 100,00 h.p. at a rate of $9.00 to $10.00 per h.p. The Commission then proceeded to construct a transmission system, which came into operation in 1910.

The Act establishing the Hydro-Electric Power Commission provided that "the expenditure of the Commission upon any works undertaken under the provisions of this Act shall be repayable to the Commission by the municipal corporations entering into contracts with the Commission, " and that "in addition to the price per horse power payable by any municipal corporation---------which shall be the cost of the power to the Commission at the point of development or of its delivery to the Commission, the corporation shall annually pay to the Commission its proportion as adjusted by the Commission of the following charges:

(a) Interest at the rate of 4 per cent. upon the moneys expended by the Commission on capital account in the construction or purchase of the works--------

(b) An annual sum sufficient to form in thirty years a sinking fund for the retirement of the securities issued by the Province under this Act for the payment of the costs of the works; and

(c) The cost of operating, maintaining, repairing, renewing and insuring the works------
(1906 C-15 S-14 & 15)

The funds for the construction of the works were to be advanced by the Government of Ontario and paid over to the Hydro-Electric Power Commission.

The capital cost of the high transmission lines was met by the issue of Provincial debentures. The capital cost of the local distribution systems was paid for by the issue of local municipal debentures under the authority of The Public Utilities Act (R.S.O. 1914, c.204, s.17)

The theory that the Commission was trustee for the municipalities was not expressed in either the 1906 or the 1907 Acts. The expression first appears in statutory form in Section 6 of the Ontario Niagara Development Act, 1917, which is as follows;

> "it is hereby declared that the Commission is to be trustee of all the works constructed or acquired under the authority of this Act for the municiapl corporations which have heretofore entered or may hereafter enter into contracts with the Commission for a supply of electrical power or energy from Niagara Falls or the vicinity, but the Commission shall be entitled to a lien upon the said works until all sums expended by the Commission on account of the construction and equipment of such works have been paid."

The expression had previously appeared in the original contract entered into by the municipalities with the Power Commission dated May 4th, 1908 and confirmed by Chapter 19 of Statutes of 1909, clause 12 of which provided as follows;

> "It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporations and other municipal corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and other municipal corporations, supplied by the Commission, having regard to the amounts paid by them, respectively, under the terms of this agreements and subject to the considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council."

This clause did not appear in the form of contract prescribed by the statute of the previous year.

N I A G A R A S Y S T E M

Page

N I A G A R A S Y S T E M

The Niagara System furnishes power to 122 municipalities and numerous private corporations between Toronto and Windsor, in southwestern Ontario. Steel tower lines are erected along the rights-of-way which are held under easement privileges or in fee simple. Transformer stations are also built at various points. From these transformer stations wood pole (low tension) lines branch out, and on these branch lines distributing stations are established from which municipalities and companies not situated on the high tension lines are served. In the last three years certain rural lines have been constructed, some of which are operated by the Commission and others by the municipalities.

Power supply

The Niagara System obtains its power supply from three main sources:

(a) The Ontario Power Company,
(b) The Canadian Niagara Power Company,
(c) Various sources--as required.

During the year ending Oct. 31, 1921 the Ontario Power Co. delivered a total of 141,800 h.p. to the Commission, as follows:

97,030 (approx.) h.p. under the terms of the original contract dated 19th March,1906, at $9.00 per horsepower;
33,770 (approx) h.p. at $18 per h.p. under the terms of an understanding and arrangement between the Company and the Commission, and

Rural Lines

The Niagara System furnishes power to 163 municipalities and numerous rural consumers in Toronto, and Windsor, in southwestern Ontario. Steel tower lines are erected along the rights-of-way which are held under easement privileges or in fee simple. Transformer stations are also built at various points. From these transformer stations wood pole (low tension) lines branch out, and on these branch lines distributing sections are established from which municipalities and companies not situated on the high tension lines are served. In the last three years certain rural lines have been constructed, some of which are operated by the Commission and others by the municipalities.

Power Supply

The Niagara System obtains its power supply from three main sources:

(a) The Ontario Power Company.
(b) The Canadian Niagara Power Company.
(c) Various sources--as required.

During the year ending Oct. 31, 1931 the Ontario Power Co. delivered a total of 141,800 h.p. to the Commission, as follows:

97,080 (approx.) h.p. under the terms of the original contract dated 15th March, 1928, at $9.00 per horse power;
74,777 (approx) h.p. at $12 per h.p. under terms of an understanding and arrangement between the Company and the Commission.

11,000 h.p. at $12.75 per h.p. This block of power was formerly supplied by the Power Co. to the Electro Metals Co. The latter released this block to the Commission for a period of about 4 years in consideration of the Commission paying $7.28 per h.p. to enable the Electro Metals Co. to procure a like amount of power from the Toronto Power Co.

The other main source of power for the Niagara System, the Canadian Niagara Power Co., supplied 49,770 h.p. at $12.08 per h.p. under the terms of what the Auditor calls an "arrangement" with that Company.

Minor quantities of power have been purchased from time to time from the Electrical Development Co., and from the Niagara Falls Power Co, in cases of emergency.

Investment in Works

The total amount of capital invested in the transmission works of the System, including right-of-way, steel tower lines, transformer stations and wood pole lines and rural lines, to Oct. 31, 1921, totalled $17,800,861.63.

For the year ending 31st Oct., 1921, the Legislature appropriated $5,515,000 for the purposes of the System. Out of this total, sums aggregating $4,549,352.73 were advanced by the Province to the Commission. This amount, together with $1,782.47 belonging to the renewal and other reserve funds of the System, was expended as follows:

Upon Transmission Works	$2,831,662.98
Upon repayment to the Central Ontario System of the amount borrowed therefrom between November 1917 and Oct. 1920 to cover in part the cost of construction of the Third Pipe Line to the works of the Ontario Power Co. . . .	1,719,472.22
	$ 4,551,133.20

The engineers of the Commission estimate that $5,712,000 will be required for the fiscal year ending Oct. 31st, 1922.

Ontario Power Co.

The Hydro-Electric Power Commission is the owner of the entire capital stock of the Ontario Power Co., which in turn owns all the outstanding capital stock of the Ontario Transmission Co.,Ltd. On June 24th, 1921 the Commission issued $3,200,000 of 6% 20-year bonds, which bonds were guaranteed by the Province of Ontario, and with the proceeds of the sale retired $2,753,000 of 6% second mortgage bonds of the Ontario Power Co. which matured on July 1st, 1921. The payment of these bonds had been guaranteed by the Commission and the Province under the terms of the purchase agreement dated Oct. 1st, 1917.

In addition to the issue of $8,000,000 40-year 4% debentures of the Commission guaranteed by the Province, and the $3,200,000 above referred to, the Commission had advanced to Oct. 31st, 1921 $3,515,094.93 to the Ontario Power Co. in connection with the construction of the Third Pipe Line.

The Commission is also responsible under the terms of purchase of the Ontario Power Co. for the payment of $10,348,000 mortgage bonds of the Ontario Power Co. maturing in 1943-45. The Province has also guaranteed the fulfilment of this obligation.

Sinking Funds, etc.

The Power Commission Act does not appear to contemplate the purchase by the Commission of shares of generating and transmission companies, hence there is no explicit provision as to the setting up of sinking funds for repayment of purchase price paid or as to the price to be charged for power by a company, the shares of which are so purchased by the Commission. It was not until the year 1920 that the Commission acquired all of the outstanding shares and became the owner of all the capital stock of the Ontario Power Co., and accordingly the Commission operated the Ontario Power Co. as a separate entity distinct from the Niagara System. The Auditor expresses the opinion in his latest report that the Ontario Power Co. and the Ontario Transmission Co. must still be so operated on account of the $10,348,000 of bonds of the Companies outstanding in the hands of the public. "On the other hand" points out Mr. Clarkson, "with the whole of the capital stock of such Companies now in the hands of the Commission the risk of their operation falls upon the Commission while the ultimate benefits accruing from them will enure to it."

For the fiscal year ending Oct. 31, 1921 the Commission adopted the policy of dealing with the shares of the Ontario Power Co. and the Ontario Transmission Co. on the same basis as though they were "works" of the Niagara System and subject to provisions of Sec.23 of the Act. Accordingly the rates for power delivered to the Niagara System by the Ontario Power Co., along with the other revenues of the Ontario Power Co. were, according to the Auditor, sufficient to meet all operating expenses and all interest on advances by the Commission (purchase price), reserves for renewals and instalments on account of sinking fund sufficient to repay the cost of the Third Pipe Line in 30 years and the bonds and debentures issued by the Commission in respect of the undertaking within 40 years.

Queenston-Chippawa Development

The Ontario Niagara Development Acts of 1916 and 1917 authorized the construction and operation of what is known as the Queenston-Chippawa Development. To Oct. 31, 1921 the Commission had expended $58,018,366.89 upon the undertaking. Of this total, sums aggregating $53,040,674.52 were appropriated by the Province, and the balance of $4,977,692.37 was applied by the Commission out of moneys advanced by the Province for the purposes of other Systems to the extent of $4,806,215.78, and out of renewal and reserve funds to the extent of $171,476.59.

Estimates furnished by the Commission to the Province show that $8,000,000 will be required in respect of the

For the fiscal year ending Oct. 31, last the Commission advised the Minister of dealing with the finance of the Ontario Power Co. and the Ontario Transmission Co. on the same basis as though they were "owners" of the Niagara System and subject to provisions of Sec.38 of the Act. Accordingly the rates for power delivered to the Niagara System by the Ontario Power Co., along with the gross revenues of the Ontario Power Co. were, according to the Auditor, sufficient to meet all operating expenses and all interest on advances by the Commission (particularly notes) reserves for renewals and insurance on account of claims and fund sufficient to repay the cost of the Niagara Pipe Line in 20 years and the bonds and debentures issued by the Commission in respect of the undertaking within 40 years.

Queenston-Chippewa Development

The Ontario Niagara Development Act of 1922 and 1923 authorized the construction and operation of what is known as the Queenston-Chippewa Development. By Dec. 31, last the Commission had expended $28,010,466.32 upon the undertaking. Of this total, some approximately $24,000,874.32 were appropriated by the Province, and the balance of $4,177,692.37 was applied by the Commission out of moneys advanced by the Province for the purposes of other Systems to the extent of $4,806,318.78, and out of renewal and reserve funds to an extent of $371,373.59.

Estimates furnished by the Commission to the Province show that $8,000,000 will be required in respect of the

Chippawa works for the fiscal year ending Oct. 31, 1922. On the 10th February, 1922, Sir Adam Beck reported to the Government that a total sum of $69,885,603 would be required to complete the Chippawa works for the generation of 275,000 h.p., less the sum of upwards of $3,500,000 which the Commission expected to recover as the salvage of the construction plant, buildings and stores.

It is pointed out that this total does not include the cost of new transformer stations and transmission works made necessary by the construction of the Queenston-Chippawa Development, such expenditures being included in the estimates to be expended on the Niagara System.

Reserves for Renewals

Reserves for Renewals of works on the Niagara System are provided by an annual charge of 4% on a straight line basis. The charges so made are included as part of the cost of power to municipalities receiving the same since the dates when such municipalities first began to take power from the Commission. On 31st October, 1921 there was a balance of $2,222,565.95 to the credit of this account. On 31st Oct., 1921 the accumulated amount set aside as reserve for renewals in respect of the Ontario Power Co. and the Ontario Transmission Co. amounted to $1,498,607.36. Provisions for renewals and depreciation in respect of the properties of these Companies are 1.85% per annum on the depreciable plant of the Ontario Power Co., 2.85% per annum in respect of the Third Pipe Line and 2% per annum on depreciable properties in

respect of the Ontario Transmission Co.

Reserves for renewal charges were not provided in respect of the Queenston-Chippawa Development because to Oct. 31st, 1921 the works had not been completed to the extent permitting the delivery of power.

Sinking Funds

Sinking Funds have been collected from each municipality under the provisions of Sec.25 of the Power Commission Act.

The sum of $174,531.30 was included in the operating cost of the Ontario Power Co. for the year ending Oct. 31st, 1921 to provide sinking funds in respect of the advances of the Commission in respect of the purchase and betterment of the Ontario Power Co.

The Ontario Niagara Development Act provides that the municipalities receiving power from the Queenston-Chippawa Development shall pay such a price for power delivered to them as shall be sufficient to provide a sinking fund for repayment of the cost of the works. No such sinking fund was charged for the year ending Oct. 31st, 1921 because the Chippawa canal was still in the course of construction. The total sinking fund accumulated to 31st Oct., 1921 in respect of the Niagara System was $987,717.89. This amount was collected from the 79 municipalities on the System which had been operating for a period of 5 years or more.

Result of Operations

The revenue of the System for the year ending Oct. 31,

request of the Sabaris Transmission Co.

Secretary RFA BUREAU INDUSTRY MUST-DAT DRIVING IN request of the Commodore-Gilpers Industrial Bureau in 2th. Jiri, 1921 the water was not ever considered by the which permitting the delivery of power.

Existing Dams

Existing Dams have been delivered with such pro-digal by under the provisions of Sabaris 10 ton river power mission lot.

The year of 1176,191.49 was instrumental in the generation of the Sabaris Power Co. All the power during that 1921 is purchs electric power to repair of the mission of the Transmission in repair of the Sabaris had difficulties of the Sabaris Power Co.

The Sabaris Illinois development has provided that the municipalities receiving power from the development, Intelligent shall pay such a price for power delivered to them as shall be sufficient to provide a sinking fund for repayment of the cost of the power. No such sinking fund was charged for the year ending Jan. 1921 because the Niagara canal was still in the course of construction. The final sinking fund commenced to Sept 1921 in repayment of the Niagara System was 1921,1174.00. This amount was deducted from the Municipalities of the Sabaris which have generating the power as 2 years as before.

Income of Commission

The income of the System for the year ending Dec. 31,

amounted to $4,216,465.42. The cost of power, including renewals, sinking funds, etc., was $4,308,563.17. The excess of costs over the amounts billed monthly was therefore $92,097.75, which includes a net loss on the sale of power to private companies of $16,068.83. Accordingly it was necessary for the Commission to charge the municipalities in the so-called Thirteenth Bill with a sum sufficient to meet the actual cost of power supplied to them. Of the 142 municipalities taking power from the System, eight of them which had been operating for more than 3 years had underpaid for power supplied to them up to 31st Oct., 1921, and also underpaid for power delivered to them in the fiscal year ending Oct. 31st, 1921.

Reserve for Contingencies

The balance to the credit of contingency reserve of the System as at Oct. 31st, 1921 was $24,875.01.

Rural Lines

The total amount of capital invested in Rural Lines of the System as of Oct. 31st, 1921 amounted to $476,425.45. Results of operations of the rural lines show that for the year ending Oct. 31st, 1921 the revenue amounted to $98,451.94 as against which the cost of power was $98,633.24,

ONTARIO POWER COMPANY

Circumstances leading to Acquisition

The Ontario Power Co. and the Hydro-Electric Power Commission have been closely associated since the inception of the hydro-electric movement. The first act of the Power Commission appointed in 1906 was to ask the various generating companies at Niagara Falls to submit a price on 100,000 h.p. for delivery to the Commission. The lowest tender received by the Commission was from the Ontario Power Company. Accordingly a contract was entered into between the Commission and the Company in the year . This contract called for the delivery of power to the Commission at the rate of $9.40 per h.p. up to 20,000 h.p., and when the load exceeded 20,000 h.p. the price was reduced to $9.00 per h.p. The contract was to expire in 1950 but corresponded to the term of the water lease of the Company from the Queen Victoria Niagara Falls Park Commission.

Prior to the year 1917 the Ontario Power Co. asked permission of the Q.V.N.F.Park Commission to install another 18-ft pipe line. The charter rights of the Company were for 180,000 h.p. The right of the Company to install this third pipe line was contested by the Province, and the Company therefore offered the plant for sale. After about a year's negotiation the Hydro-Electric Power Commission acquired the plant.

Methods and Terms of Acquisition

The purchase was consummated as of August 1st, 1917. J. J. Albright, Esq., of Buffalo, N.Y. acted as vendor on behalf of himself and other stockholders of the Ontario Power Co. The purchase price was $80.00 per share, payable in 40-year 4% debentures issued by the Commission and guaranteed by the Province. The issued capital stock of the Company totalled $10,000,000, and since the date of the purchase the Commission has acquired the entire $10,000,000 of capital stock of the Company and has issued in payment therefor debentures to the amountof $8,000,000.

Under the terms of the purchase agreement the Commission and the Province assumed outstanding mortgage bonds of the Company to the amount of $13,601,000. In addition to the sum of $8,000,000 referred to, the Commission last year issued $3,200,000 of 6% 20-year bonds guaranteed by the Province of Ontario and with the proceeds retired $2,753,000 of 6% second mortgage bonds of the Ontario Power Co.

As soon as the purchase was consummated the Commission proceeded with the construction of a new pipe line, and to Oct. 31st, 1921 the Commission had advanced $3,515,094.93 to the Company in connection with this construction.

Authority for Acquisition

The purchase was authorized by Sec.2 of the Power Commission Act, 1917 (7 Geo.V,Chap.20). The Section

authorized the Commission to "acquire by purchase or otherwise, on any terms, and hold shares in any incorporated company carrying on the business of developing, supplying or transmitting electrical power or energy...." and to issue bonds or other securities for the purpose. The agreement between the Commission and the Company was validated in the following year by the Power Commission Act, 1918 (The agreement is set out in full as Schedule "J" to 8 Geo.V,Chap.14,at page 152).

There is no provision in the authorizing legislation requiring sinking funds to be set up, but the policy of the Commission is outlined at page herein.

Acquiescence of Municipalities

There is no provision in the Statute or in the agreement making the Commission trustee of the stock for the municipalities. It does not appear that the municipalities were consulted in any way with regard to the purchase. In this connection it should be noted that a similar condition of affairs exists in connection with the construction of the Third Pipe Line. No evidence is forthcoming to show that this expenditure was sanctioned by the municipalities. As a matter of fact it should also be noted that the construction of the Third Pipe Line was financed by the

authorized the Commission to "acquire by purchase or otherwise, on any terms, and hold shares in any incorporated company carrying on the business of developing, supplying or transmitting electrical power or energy...." and to issue bonds or other securities for the purpose. The agreement between the Commission and the Company was validated in the following year by the Yukon Consolidation Act, 1951. (The agreement is set out in full as Schedule "B" to § 6(c.7,Chap.14,Yukon Acts 1952).

There is no provision in the authorizing legislation requiring sinking funds to be set up, but the policy of the Commission is outlined at page [illegible].

Assurance of Municipalities

There is no provision in the Yukon Act in the agreement making the Commission responsible for the municipalities. It does not appear that the municipalities were consulted in any way with regard to the purchase. In this connection it should be noted that a similar assumption of effective control in connection with the construction of the Yukon Pipe Line. No evidence is [illegible] that any [illegible] expenditure was authorized by the municipalities. As a matter of fact it should also be noted that the construction of the Yukon Pipe Line was financed by the

Commission on behalf Company negotiating a loan from the Bank of Montreal for the sum of $1,350,000 and by paying out of funds appropriated for the purposes of the Central Ontario System an amount in excess of $1,500,000. There was no statutory authority for the use of these particular funds.

THOROLD SYSTEM

THOROLD SYSTEM

Statement of Fact

Thorold System comprises a small group of distribution stations and transmission lines over which power purchased from the Ontario Power Company is transmitted to customers on what was formerly known as the "Battle" system [1] in the vicinity of Thorold. The system was purchased by the H.E.P.C. as of 1st December, 1918, at a price of $100,000. and paid for in 4% forty year bonds of the Commission guaranteed by the Province.

The purchase price was made up as follows:-

Valuation of lines, stations and distributing system	$25,872.41	
Capitalized value of commissions or royalties receivable	57,500.00	
Capitalized value of power sale contracts and value of power available under the contracts	16,627.59	
		$100,000.00

The system is owned by the H.E.P.C. and operated at its own risk with no municipality under direct responsibility for its cost of operation. [2]

The municipality of Thorold has a population of 5012.

As the purchase price of the System was paid in Hydro bonds guaranteed by the Province the provisions of the Power Commission Act with regard to sinking fund for

repayment of the investment do not appear to be required. The purchase price is not considered to be an "advance" within the meaning of Section 23 of the Act.

However the Commission has in each year charged against the revenue of the System amounts sufficient to pay $57,500. of the purchase price. (representing royalties acquired) within 24 years, and to repay $42,500. of the purchase price, (representing lines, stations and value of power contracts) within 40 years.

The system has been showing for some years an operating profit. It does not appear to have been determined, either as a matter of law or policy, what disposition is to be made of the profits; whether they are to be absorbed in the general profits of the Niagara System and to be credited to the municipalities or whether they are to be set off against any loss in other systems, like losses in the Essex system.

It is to be noted that on 20th December, 1920, the municipality of Thorold entered into a contract with the Commission to purchase power at the cost of delivering same, including operating expenses, interest and provisions for renewal of works and sinking fund. The engineers of the Commission were of the opinion that such cost should include

a proportionate part of the generating and transmission cost of the Ontario Power Company from which the supply of power is purchased. Up to the present time the generating and transmission costs of the Ontario Power Company have not been allocated to determine the proportionate part payable by the Town of Thorold on the power supplied to it and the rate of $22.25 per horse power has been collected from Thorold as an interim rate.

The revenue for the year 1921 amounted to $83,050.15, against which costs of operation, including renewal and sinking fund were $39,083.30, leaving a profit for the year of $43,966.85. This amount together with a surplus brought forward as of 31st October, 1920, of $13,602.03, makes a total of $57,568.88, which was appropriated for the purpose of providing additional sinking fund reserves against the Commission's investment in the intangible assets of the System.

It has been noted that under Section 15 of the Power Commission Act that all sums receivable by the Commission from municipal corporations and others on sinking fund account shall be invested by the Commission in securities of the Province of Ontario and such securities shall

be delivered by the Commission to the Treasurer of Ontario as security for repayment of the advances made by the Province to the Commission. (3) As the Commission has purchased the system direct and the municipalities are not in any way responsible the Commission has not invested the sinking fund of the system in securities of the Province for delivery to the Treasurer, taking the stand that the system is not within the meaning of the Act as the bonds for the purchase were only guaranteed by the Province and not in the nature of an advance for construction.

Notes

(1) 9 Geo. V. cap. 16, page 177 et seq.

(2) Auditor's report; ;920, page 42

(3) Auditor's report; 1921, page 65.

(4) Auditor's report; 1920, page 44.

Observations and Addenda

E S S E X S Y S T E M

ESSEX SYSTEM

Statement of Fact

The Essex System was purchased under an agreement dated 22nd May, 1918, from the Essex County Light & Power Co.,Ltd., which was controlled by the Detroit Edison Company. The purchase price was $226,000. and was paid for as follows:

$200,000 - 4% 40-year H. E. P. C. bonds
26,000 - 5% 10-year do.

These bonds are all guaranteed by the Province.(1) The reason for the purchase of this System was because the various municipalities included had applied to the Commission for relief because the demand for power had exceeded the supply which could be given by the Essex Light & Power Co. from their steam plant at Sandwich.(2) Power was supplied to the municipalities of Amherstburg, Leamington, Kingsville, Essex, Harrow, Cottam and Canard River. The following is the approximate population of the municipalities served:

Amherstburg	2,540
Leamington	3,652
Kingsville	1,427
Essex	1,353
Cottam	333
Canard River	50
Harrow	619
	9,994.

The Commission undertook the construction of a connecting line to the Niagara System, and until this was completed, up to Oct. 31st, 1918, power was supplied from the steam plant at Sandwich.

Statement of Debt

The debt system was practically wiped out on December [illegible] Land Day, 1916, from the Green County alone [illegible] 1916, which was contributed to the Treasury Department [illegible]. The purchase price was $[illegible] [illegible] and [illegible] for as follows:

$[illegible],000 - 4% 40-year [illegible]
$6,000 - 5% 10-year [illegible].

These bonds are all guaranteed by the province.[1] The reason for the purchase of this System was because the various municipalities involved had doubts (1) the [illegible] matters had called because the [illegible] and [illegible] needed the supply which would be given by the Green Light & Power Co., from their plant which is located [illegible].[2] [illegible] was supplied in the municipalities of [illegible], Leamington, Kingsville, [illegible], [illegible], [illegible] River. The following is the [illegible] published in the municipalities served:

Leamington	[illegible]
Learnington	[illegible]
Kingsville	[illegible]
Essex	[illegible]
Tilbury	[illegible]
Ramore Stony	[illegible]
Lakeview	[illegible]
	[illegible]

The Tunnelgate contracted the transmission of a [illegible] overhead line to the Wheaton plant. And until then the [illegible] of Mr. Eph. Gill, [illegible], serve had supplied from the steam plant at Leamington.

This System is owned directly by the Hydro-Electric Power Commission and power is retailed direct to the various users throughout the System without the intervention of any local municipal commissions, and is operated at the Commission's own risk. The Commission claim that this is not a system according to the meaning of the Power Commission Acts and consequently there is no liability on the part of the Commission to charge actual cost for power supplied, nor is there any liability to establish sinking funds to retire the bond issues according to the Power Commission Act.(3)

Since this plant was purchased additions and extensions have been made to it, extensions including a group of rural lines constructed in the vicinity of Leamington and Kingsville. The System is managed from an office at Leamington.

Investment in Work:

To October 31st, 1921 capital invested in the Essex System amounted to $375,141.34, which was provided by

1- Issue of bonds given in purchase of the System	$226,000.00
2- Cash advances by the Commission out of sums advanced by the Province	22,000.00
3- Cash advances by the Commission out of renewal and reserve funds	127,141.34
	$ 375,141.34

Expenditures in respect of lines and works of the System for the year ending 31st October, 1921, amounted to

This system is owned directly by the Kyano-Electric Power Transmission and power is retailed direct to the various towns throughout the system without the intervention of any local municipal commissions, and is operated at the Commission's own risk. The Commission claim that this is an a system unknown in the country of its origin, as the only and responsible body in the country, and it is the Commission's opinion that the system supplied, and it alone can CERTAINLY be responsible for funds to retire the bond issues according to the Power Transmission Act.[1]

Since this plant was purchased additions and enlargements have been made to it, extensions including a group of rural lines constructed in the vicinity of Cunningham and Kingsville. The system is managed from an office at Lowmarsh.

Investment in Plant

On Finance Sheet, 1941 Annual Statement in the Power system amounted to $[illegible], which was payable as

1- Loans of bonds given in purchase of the system	[illegible]
2- Bank advances by the Commission out of sums advanced by the Province	[illegible]
3- Bank advances to the municipalities out of revenue and income	
Total	$ [illegible]

Expenditures in respect of lines and works of the system for the year ending 31st October, 1941, amounted to

$26,472.12.

In the year ending 31st Oct., 1921, appropriations were made by the Legislature for the purposes of the System to the extent of $25,000, of which $22,000 were on the Commission's requisition paid over. This was expended on capital construction.

To 31st Oct., 1920 the Commission had advanced to the Essex System $149,516.56 out of renewal and other reserve funds held by it to the credit of other systems, and in 1921 such advances were reduced by $22,375.34, leaving a balance still owing as of 31st Oct.,1921 of $127,141.34.

Reserve for Renewals

Reserves for Renewals were provided by an annual charge of 4% on capital invested, together with interest at the rate of 4% on the balance remaining from time to time, equalling a renewal rate of approximately 8$\frac{1}{2}$% per annum on a straight line basis.

Sinking Funds

Although the Commission do not regard themselves liable under the Power Commission Act to establish a sinking fund account, they have for the whole period of operations to Oct. 31, 1921 included sinking fund instalments of amount sufficient to meet the bonds given in purchase of the System at the maturity thereof. The amount placed to the credit of sinking fund account to the 31st October, 1921 was $15,328.35.

Results of Operations

There has been a deficit of $32,766.32 met with in the operation of the System to 31st October, 19 1, but that deficit has been caused by the creation of sinking fund account and renewal reserve. The accumulated operating deficit of the System to Oct. 31st, 1921 was $41,316.86, but this amount was reduced by a profit of $8,550.54 made last year, which leaves the net deficit above mentioned, $32,766.32 for the full period of operations to 31st October, 1921. (3)

ESSEX SECTION

Notes

(1) H. E. P. C. Annual Report 1919, page 30.
Agreement between H.E.P.C. and Detroit Edison Co. set out in full

(2) H. E. P. C. "Bulletin" Sept.1919, page 34

(3) Auditors' Report 1921, page 61-

[illegible]

Observations and Addenda

C E N T R A L O N T A R I O S Y S T E M

Central Ontario System

This system was purchased by the Provincial Government from the Electric Power Company Limited (Sun Life interests) on first March, 1916. On the 1st June , 1916, the Hydro-Electric Power Commission took over the operation of the system acting as trustee for the Ontario Government. (Hydro Bulletin Aug. 1916, page 25)

The purchase of the system was authorized by the Central Ontario Power Act, 1916. The system although operatdd by the the Hydro-Electric Power Commission is owned outright by the Province of Ontario. There had been negotiations between the Hydro-Electric Power Commission and the Electric Power Company Limited to take over the system on the same basis as other systems but the Government ultimately determined to purchase the system outright.

The purchase price was $8,500,000 payable in debentures of the Province. Up to March 20th, 1920 the Province had advanced to the Hydro-Electric Power Commission an additional $1,683,396 in cash for the improvement of the system, and also $25,000 to purchase a timber limit in connection with the pulp mill included in the system.

8,350,000
2,700,000
5,650,000

Of the $8,350,000 originally paid for the purchase of the system the sum of $2,700,000 was included in the purchase price for water rights, franchises and other assets of a non-income returning character. (Memo. of Mr. Ellis) (See speech of Sir Adam Beck quoted in Biggar 73.)

The system consists of 2 divisions;

1. Sometimes called the Nipissing System, including North Bay, Glaendar, Powassan and Nipissing served from a generating station at South River.

2. A System comprising 6 development plants as follows;

   Trenton
   Healey Falls
   Frankford
   Campbellford
   Auburn
   Fenelon Falls
   a seventh generating plant is under construction at Manney Falls.

The municipalities included in the second branch of the system are;

Belleville	Bowmanville
Brighton	Camden East
Cobourg	Colborne
Deseronto	Lindsay
Millbrook	Napanee
Newcastle	Newburg
Oshawa	Orono
Peterboro	Port Hope
Trenton	Tweed
Whitby	

The system includes, in addition to power development works and transmission lines, purely local works such as electric light and distribution plants in municipalities;

gas works in several municipalities; the power dam at Peterboro; the Peterboro street railway; a pulp mill at Bancroft; and a timber limit.

Certain water rentals are paid to the Dominion Government for the use of the water of the Trent Valley Canal.

CENTRAL ONTARIO SYSTEM.

Scope of System:

Under agreement dated March 10th, 1916, the Central Ontario System was acquired by the Province of Ontario from the Electric Power Company, Limited, the purchase price paid therefpr being $8,350,000. of ten year 4% Bonds of the Province due March 1st, 1926. By Order-in-Council dated May 5th, 1916, administration and management of the Sy tem was vested in the Hydro Electric Power Commission of Ontario.

The Central Ontario System is divided into two sections, one known as the Central Ontario Section and the other as the Northern or Nipissing Section.

The Central Ontario Section comprises certain power development plants on the Trent River, transmission lines and transformer stations connected therewith and local electric distibuting Systems, including those in Belleville, Bowmanville, Cobourg, Deseronto, Lindsay, Napanee, Oshawa, Port Hope, Trenton, Tweed, Newcastle, Orono, Brighton, Millbrook and Newburgh. Power is also sold by the System to other municipalities and customers. The System in addition owns gas works at Cobourg and the Peterboro Street Railway. A pulp mill at Campbellford is operated by the System and pulpwood areas in Bruton Township were purchased by the Province in 1917 to provide a supply of wood for such pulp mill.

The Northern Section (generally known as Nipissing Section) consists of a power development plant at Nipissing near North Bay, with transmission lines and transformer stations connected therewith and local distributing Systems in North Bay, Powassan, Nipissing and Calendar.

Statement of Assets and Liabilities:

A stateme t of the Assets and Liabilities of the System as of date October 31st, 1921 is attached hereto as Schedule 86.

Investment in Works and Assets of the System:

Capital invested in the works and assets of the System as on October 31st, 1921, was as follows:

In works of Central Ontario Section

(a) Power development and Hydraulic rights	$5,065,976.64
(b) Transformer Stations	1,118,381.09
(c) Transmission Lines	1,726,421.05
	$7,910,778.78

Brought forward	$7,910,778.78	
(d) Local utilities including electric gas and water works and Peterboro Street Railway	2,369,495.58	$10,280,274.36
In works of the Nipissing Section		
(a) Power development and steam plant	419,734.42	
(b) Transformer Stations	35,492.22	
(c) Transmission Lines	43,322.00	
	$498,548.64	
(d) Local utilities - electric	184,236.23	$ 682,784.87
Rural Lines		31,321.96
Pulp Mill and Pulpwood Areas		509,114.50
		$11,503,495.69
Investments:		
Debentures of the Town of Trenton, re Sale of Water Works	$20,005.56	
Debentures of the Town of Napanee, re Sale of Property and Water Privileges	12,499.15	
Cash in Bank	4,780.95	
Accounts Receivable, less reserve for doubtful accounts, including balance owing by certain municipalities who have contracted to pay the cost of power delivered to them	199,338.66	236,622.32
Inventories:		
Tools and Equipment	56,108.25	
Materials and Supplies	445,676.00	501,784.25
Carried Forward		$12,241,902.26

Brought Forward		$12,241,902.26
Operating Items:		
Prepaid Expenses	$5,026.78	
Deferred maintenance costs	42,638.87	
Deficit - operating	168,930.15	216,895.80
a total of		$12,458,698.06

less Liabilities of -

1. Due to Hydro Electric Power Commission of Ontario	$18,638.42	
2. Accounts Payable and accrued charges owing by the System	78,122.11	
3. Balances owing to certain municipalities, being the excess of the amounts paid by them over the cost of power delivered for their use	7,180.07	
4. Reserves for Renewal of Works	1,044,426.52	
5. Reserves to meet Contingencies	7,952.61	
6. Reserves for Sinking Funds in respect of investments in the Bruton Township Pulpwood areas and the Rural Lines	28,665.54	1,184,985.28

leaving the amount of capital which was invested in the System by the Province.....$11,273,712.78
which was provided by the Province in manner following:

1. By the purchase price paid by the Province in ten year 4% Bonds of the Province due March 1, 1926	8,350,000.00	
2. By 5% debentures due July 1, 1927 issued by the Province in purchase of Bruton Township Pulpwood areas	225,000.00	
3. By Cash advances of the Province to October 31, 1921 - less $1,719,472.22 refunded to the Province in 1921	2,698,712.78	$11,273,712.78

Brought Forward

Operating Income:

Profit Accounts:

Electrical maintenance income

Profit - operating

Less Liabilities of -

1. Due to Hydro Electric Power Commission of Ontario

2. Accounts payable and accrued charges owing by the System

3. Balance owing to contain municipalities, being the excess of the amounts paid by them over the cost of power delivered for their use

4. Reserve for Renewal of works

5. Reserve to meet Contingencies

6. Reserves for Sinking Funds in respect of investments in the Irwin Township Rainwood Street and the Rural Lines

leaving the amount of Capital Account, Surplus in the System by the Provisions of Section 12(1) of the Act, which was provided by the Province in manner following:

1. By the purchase price paid by the Province in ten year 4% Bonds of the Province the Part 1, 1926

2. By 5% debentures due July 1, 1927 issued by the Province in payment of Irwin Township Capital Accounts

3. By Cash advanced by the Province to Township 30, 1926 - Part 1, 1926-1927 repaid to the Province in 1927

For the fiscal year ending October 31st, 1921 the sum of $1,561,000. was appropriated by the Legislature for the purposes of the System, while $27,000 was authorized by Treasury Board Minute - a total of $1,588,000. Of this amount sums aggregating $820,000. were requisitioned ~~and~~ by and paid over to the Commission in the year. All of such advances were expended for the purposes of the System, together with $78,642.41 out of renewal and other reserve funds belonging to the System - a total of $898,642.41. (See Schedules 4 and 18).

The expenditures upon the works of the System in the year ending October 31st, 1921, consisted of -

<u>On the Central Ontario Section:</u>		
(a) Upon power developments, principally Ranney's Falls	$557,447.91	
(b) Upon transmission lines	11,907.68	
(c) Upon transformer Stations	33,909.09	
(d) Upon local utilities	169,987.20	
(e) Upon rural lines	509.80	$773,761.68
<u>On the Nipissing Section:</u>		
(f) Upon power development	56,436.52	
(g) Upon local utilities	13,557.50	69,994.02
In connection with the Bruton Township Pulpwood areas, including the construction of a barking mill at Bancroft		54,886.71
To a total of		$898,642.41

To complete works under construction and make betterments and extensions to the System - including the construction of certain rural lines - Engineers of the Commission expect that $1,048,000 will require to be expended in the fiscal year ending October 31st, 1922.

<u>Reserves for the Renewal of Works:</u>

Reserves for the renewal of power developments, stations and lines of the System are provided by an annual charge included in the costs of operations of 2½% on the amount of capital employed, exclusive of that invested in undeveloped hydraulic rights, franchises etc. Reserves for the renewal of works of the various local utilities owned by the System and the pulp mill are provided at the rate of 3½% per annum on capital invested. Such reserves are augmented by interest allowed at the rate of 4% per annum on balances standing from time to time to the credit of the account, making the rates equal to approximately 4% and 5% per annum on a

For the fiscal year ending October 31st, 1921 the sum of $1,021,000. was appropriated by the Legislature for the purposes of the System, while $47,000 was authorized by Treasury Board Circular - a total of $1,068,000. Of this amount some $477,000. were expenditures made by and paid over to the Municipalities in the year. All of loan advances were expended for the purposes of the System, together with $71,000.41 was at revenue and other receipts paid directly by the Commission - a total of $548,041. The Commission - see 1921.

The expenditures upon the works of the System in the year ending October 31st, 1921, consisted of -

On the Central Ontario Railway	
(a) Upon power development, principally Ismay's Falls	$[illegible]
(b) Over transmission lines	[illegible]
(c) Upon transformer stations	[illegible]
(d) Over local utilities	[illegible]
(e) Upon rural lines	900.00
	$[illegible]
On the Niagara Limits	
(a) Upon power development	[illegible]
(b) Over local utilities	[illegible]
In connection with the Crown Township Lumber Estate, including the construction of a working mill at Temagami	[illegible]
To total of	$[illegible]

The complete report gives particulars and main statements and estimates of the System - including the expenditure on actual rural lines - Engineers of the Commission, report that $3,[illegible] will require to be expended in the fiscal year ending October 31st, 1922.

Matters for the Consent of Parliament:

Matters for the consent of Parliament, briefly stated, are - the rates of the System are provided by an annual statute included in the Acts of Ontario of 1921 on the matters of capital employed, maintenance of plant insured in underwriters' tariff, prudent reserve, etc. Concerning the present of work of the various local utilities owned by the System and the only will are provided at the rate of 3½ per annum on capital invested. Such securities are supported by interest allowed at the rate of 4% per annum on balances standing from time to time in the credit of the Commission, which interest allowed at time is the credit of the Commission, [illegible]

straight line basis. A statement of the Renewals account is attached hereto as Schedule 91 and it indicates that, after deduction of the cost of renewals, the amount to the credit of the accountof the a count on October 31st, 1921 was $1,044,476.52 an increase of $231,916.77 for the year.

Sinking Funds:

With the Central Ontario System owned by the Province of Ontario the operations of the System do not require to be conducted subject to the provisions of the Power Commission Act, and particularly Section 23 thereof. With this the case there is no obligation upon the Commission to establish sinking funds for the repayment of the investments of the Province in or its advances to the System. There is equally, however, nothing to prevent the Commission establishing sinking funds in respect of the costs of any particular works of the System, if, in its opinion, it deems it advisable so to do.

Sinking Funds had to October 31st, 1921, been set up by the Commission in respect of the following specific investments and to these extents -

(a) In respect of the costs of rural lines in the Townships of Whitby, East Whitby and Pickering	$1,847.65
(b) Redemption of bonds issued in purchase of the Bruton Township Pulpwood Limit	24,955.66
(c) In respect of the Bancroft mill operated in connection with the pulp mill	1,862.23
	$28,665.54

The sinking funds in respect of the rural lines in the Townships of Whitby, East Whitby and Pickering, while set up and appearing upon the books of the Commission, were offset by a deficit to October 31st, 1921, of $10,899.09 incurred in the operation of the line, which deficit is collectible from the Townships mentioned under the terms of contracts with them. The Sinking Funds set up in respect of the Bruton Township Pulpwood Limit and the Bancroft mill have been provided out of the revenues of the pulp mill and retained for the System by the Commission as the provisions of Section 15 of the Power Commission Act do not require that they be invested in securities of the Province of Ontario for delivery to the Treasurer of Ontario.

In March 1913 and at dates subsequent to March 1st, 1916 (the date of purchase of the Central Ontario System by the Province of Ontario) the Commission entered into contracts with the City of Peterboro, the Town of Picton, and the Villages of Bloomfield, Lakefield, Havelock, Marmora, Norwood and Wellington, under the terms of which such municipalities undertook to purchase power from the Commission (acting for the Central Ontario System) and to pay cost for the same on the bases laid down in their con-

tracts, requirements of which are similar to thos provided under Section 23 of the Power Commission Act. In such contracts it was, amongst other things, provided that the municipalities should pay sinking funds on the cost of the "works" used in connection with the supply of power to them and that the Commission should hold such"works" as Trustees for the municipalities subject to a lien upon them for "all moneys expended by the Commission under this agreement and not repaid". In all but one or two instances, such contracts were validated by the Legislature. The Town of Whitby has also, since 1916 been receiving a supply of power from the Commission on such cost basis but to this date it has executed no contract with the Commission.

The costs payable by such municipalities were not possible of being calculated for reasons hereinafter mentioned, in the periods of operation prior to October 31st, 1918. For the periods subsequent to that date, however, such costs were possible of being computed and they were calculated but not given effect to (as is mentioned in my previous report) until within the fiscal year ending October 31st, 1921 when they were made retroactive as from November 1st, 1918. In computing such costs however, the sinking funds required to be paid by the municipalities under contract with them were not included in the costs of power to them and to October 31st, 1921 no charge in respect of such Sinking Funds has been made to the municipalities.

With costs for power delivered - excluding sinking funds - charged to the municipalities above mentioned, the System is now being operated upon a footing where

(1) Power is sold to certain municipalities under contracts with the Commission, which contracts require that the municipalities pay the costs to the Commission of the power delivered to them - including Sinking Funds, - while the agreements between the municipalities and the Commission also provide that the Commission holds "works" of the System as Trustees for the municipalities subject to a lien "for all moneys expended by the Commission under this agreement and not repaid".

(2) Power is sold by the Commission to certain municipalities and companies at flat rates per H.p.; the agreements with such municipalities do not provide that they have or shall have any proprietary interest in the System neither are the municipalities required to pay sinking funds in respect of the"works" of the System.

(3) The Commission, as representing the Province, is operating a number of local utilities which take power from the System and retail it to customers resident in various municipalities.

(4) The Commission, representing the Province, operates the Peterboro Street Railway and the Campbellford Pulp Mill, which take power from the System and pay cost for such power, excluding Sinking Funds.

[illegible] municipalities, [illegible] Commission [illegible]. In some instances it was [illegible] that the municipalities [illegible] money on the [illegible] work on the "[illegible]" [illegible] the [illegible] and that the Commission [illegible] "[illegible]" in [illegible] for the municipalities [illegible] a [illegible] than for "all moneys expended by the Commission under this agreement and not repaid". In all but one or two instances such contracts were ratified by the Legislature. The [illegible] Act, also [illegible] the Commission [illegible] [illegible] in [illegible] with the municipalities.

The main payments by rural municipalities were not payable at fixed maturities for reasons mentioned previously. In the periods of [illegible] prior to [illegible] 1918. For the periods subsequent to [illegible], [illegible] were [illegible] of being [illegible] and they were [illegible] but not given effect to (as is mentioned in my previous report) until within the fiscal year ending October 31st, 1921 when they were made retroactive as from November 1st, 1918. In [illegible] that year [illegible], the [illegible] payments required to be paid by the municipalities under contracts with them were not included in the [illegible] of power to them and to October 31st, 1921 no charge in respect of such financing [illegible] been made in the municipalities.

[illegible] - [illegible] - [illegible] referred to the municipalities above mentioned, the system is now being operated upon a [illegible] where

(1) Power is sold to certain municipalities under contracts with the Commission, which contracts require that the municipalities pay the costs to the Commission of the power delivered to them - including financing [illegible] - while the arrangements between the municipalities and the Commission also provide that the Commission holds "works" of the System as Trustees for the municipalities subject to a lien "for all moneys expended by the Commission under this agreement and not repaid".

(2) Power is sold by the Commission to certain municipalities at flat rates per K.W.H. the agreements with such municipalities do not provide that they have or shall have any proprietary interest in the System either as the municipalities required to pay financing funds in respect of the "works" of the System.

(3) The Commission, as representing the Province, is operating a number of local utilities which take power from the System and retail it to consumers resident in various municipalities.

(4) The Commission, representing the Province, operates the Northern Ontario Railway and the Temiskaming [illegible] Mill, which take power from the System and [illegible] power, excluding financing funds.

With such conditions in force it is not impossible or improbable that confusion may come about as to what the exact rights of the Province or the municipalities mentioned are if Sinking Funds be collected from such municipalities as part of the cost of power delivered to them and they are so permitted to obtain a proprietary interest in the System. Under such circumstances I recommend that the condition of affairs be discussed between the Government and the Commission and some definite basis be arrived at which will determine whether the System is to continue to be owned by the Province or in the alternative it is to pass to the municipalities subject to a lien for repayment of the investments in and advances of the Province to the System. Such an understanding should in my opinion be come to before any Sinking Funds are collected from the Municipalities - as part of the cost of power to them - for with acceptance of such Sinking Funds they will obtain an interest in the System which would then be owned jointly by the Province and the municipalities with doubt obtaining as to whether - so owned - it has to be operated under the provisions of the Power Commission Act or not.

RESULTS OF OPERATIONS:

Revenue and Expenditure Account of the System for the year ending October 31st, 1921 is attached hereto as Schedule 87. The revenues of the System are derived from-

(a) Sales of power to Companies and certain municipalities at definite rates per horse power per annum

(b) Sales of power to certain other municipalities who are obligated under their contracts with the Commission to pay actual cost of power delivered to them

(c) Electric lights, gas and water rates collected from consumers who are customers of local utilities owned by the Commission

(d) Receipts from operations of the Peterboro Street Railway

(e) Moneys received on the re-sale of electrical appliances, supplies, etc.

(f) Receipts from operation of the pulp mill at Campbellford.

Receipts for the year from sales of power, electric light, gas and water rates and from the Peterboro Street Railway amounted to $1,451,702.41
as against which the costs of operations, including power purchased, maintenance and reserves for renewals and contingencies, but excluding interest paid to the Province

Forward	$1,451,702.41
on the purchase price of the System and its advances thereto, were	1,064,601.43
leaving a balance of	387,100.98
Profits on the sales of equipment and supplies in the year were	32,794.04
	$419,895.02
from which there has to be deducted the net loss for the year on the operations of the pulp mill and Bruton Township pulpwood areas (as set out in detail in Schedule 88)	17,693.84
leaving a surplus of	$402,201.18
Out of sums paid in the year to the Province as interest upon its investments in and advances to the System, there was charged direct to the costs of operation of the System (exclusive of interest charged direct to the costs of operation of the pulp mill and Bruton timber limit) the sum of	444,875.21
converting the above surplus into a net operating deficit for the year of	$ 42,674.03

Statement of the operations for the year of the Pulp Mill at Campbellford and the Bruton Township limit are attached hereto as Schedule 88 and they show a loss for the period of $17,693.84 after

(a) Reductions of $33,832.60 in inventories allowed to meet deflations in the values of pulp wood and pulp inventories at the Campbellford mill)

(b) The setting aside of an appropriation of $42,000. to provide for depreciation in the value of pulpwood on hand on the Bruton Township limits and at railway sidings.

(c) Appropriation of $20,400 charged against operations - as interest and sinking fund allowances - to meet depletion in the value of the Bruton limit in respect of wood cut there-off in the season.

The amount of interest paid by the Central Ontario System to the Province in the year was $459,609.04 and with ownership of the System vested in the Province, such amount may fairly be regarded as the return received by the Province on its investment in, and advances to, the System.

Present

on the preceding price or the Trustee has its advance charges, more	1,164,[illegible]
leaving a balance of profits on the sale of [illegible] and supplies in the year year	41,[illegible]
	[illegible]
	64,[illegible]
less which there has to be deducted the net land for the year on the operations of the pulp mill and Grand Trunk Railway Company area [illegible] in detail in [illegible]	[illegible]
leaving a surplus of Out of this gain in the year to the Province or interest upon the investments is not available to the Crown, there was charged direct to the costs of operation of the Pulp Mill (exclusive of interest charged direct to the costs of operation of the pulp mill and Crown timber limit) the sum of	4[illegible],[illegible].10
converting the above surplus into a net operating deficit for the year of	[illegible]
	4 [illegible]

Statement of the operations for the year of the Pulp Mill at Campbellford and the Crown Timber Limit are attached hereto as Schedule "A" and they show a loss for the period of $17,[illegible].56 after

(a) Reductions of $23,[illegible].60 in inventories allowed to meet deficiency in the return of wood and pulp inventories as the Comptroller will

(b) The matter which is to be appropriated by [illegible], to provide for depreciation in the mills or replaced on land on the Crown Timber Limits and at railway siding.

(c) Approximately [illegible] expended operations - at interest and sinking fund allowance - to meet deficits in the mills or the Crown Limit in respect of wood not transported in the season.

The amount of interest paid by the Central Ontario System to the Province in the year was [illegible] and with respect of the Crown works in the province, such amount may fairly be regarded as the return received by the Province on its investment in,and advances to, the System.

To October 31st, 1920 the accumulated deficit to the debit of Operating Account of the System was $167,530.90
This amount was increased in the fiscal year ending October 31st, 1921, by

(a) Further provisions required to be made in respect of additional water rentals payable to the Dominion Government for the period between March 1st, 1916 and October 31st, 1920		11,722.67
(b) Balances due to certain municipalities in respect of amounts paid by them in the two years ending October 31st, 1920 in excess of the cost of power supplied to them - as provided to be paid under their contracts with the Commission		2,312.21
a total of		$181,565.78

from which there was deducted -

(1) Balances due by certain municipalities being the difference between the cost of power supplied to them in the two years ending October 31st, 1920 (as provided to be paid under their contracts with the Commission) and the amounts actually paid by those municipalities to the Commission in that period	$46,774.00	
(2) Balances due by certain municipalities in respect of the operation of the "Oshawa" rural lines to October 31st, 1920	8,535.66	55,309.66
leaving an accumulated deficit to October 31st, 1920 - revised as above - of		$126,256.12
to which there was added the operating deficit for the year ending October 31st, 1921, of		42,674.03
making a deficit for the whole operating period between March 1st, 1916 (the date of purchase of the System by the Province) and October 31st, 1921 of		$168,930.15

The $2,312.21 added in the above statement to the deficit of October 31st, 1920, represents overpayments by the municipality of Picton, being the excess of the sums paid by it for power, in the two years ending October 31st, 1920, as compared with the cost of such power delivered to it - exclusive of Sinking Funds - as calculated by the Commission under the

To October 31st, 1920 the accumulated deficit on the basis of operating income at the rates the Tax Commission was instructed in the first year ending October 31st, 1921, by

(a) Further provisions equivalent to 25 mills in respect of additional water rentals payable to the Municipal Government for the years between March 1st, 1918 and October 31st, 1920 [illegible]

(b) Balances due in certain municipalities in respect of amounts paid by them to the two years ending October 31st, 1920 in excess of the rate of levy required to meet contracts with the Commission [illegible]

a total of [illegible]
from which there was deducted -

(1) Balances due by certain municipalities being the difference between the cost of power supplied to them in the two years ending October 31st, 1920 (as provided to be paid under their respective contracts) plus the amount actually paid by those municipalities to the Commission in that period [illegible]

(2) Balances due by certain municipalities in respect of the operation of the Provincial Lines in October 31st, 1920 [illegible]

leaving an accumulated deficit in October 31st, 1920 - applied as above - of [illegible]
which there was added the operating deficits for the year ending October 31st, 1921, of [illegible]
making a deficit for the whole operating period between March 1st, 1918 (the date of proclamation of the Act) by the Provincial and October 31st, 1921 of [illegible]

The 31,811.41 added in the above statement to the deficit of October 31st, 1920, represents expenditure by the municipality or towns, being the amount of the rate paid by it for power, in the two years ending October 31st, 1920, as compared with the 1921 or 1922 power derivable in a municipality

terms of the contract with such municipality.

The $46,774. applied in reduction of the deficit to October 31st, 1920, as shown in the above statement represents under payments for power by the municipalities of Bloomfield, Lakefield, Peterboro, Wellington and Whitby for the two years ending October 31st, 1920; as compared with the cost of such power - excluding sinking funds - as calculated by the Commission under the terms of the contracts with such municipalities.

The item of $8,535.66 also applied in reduction of the deficit to October 31st, 1920, represents deficits in the operation of the Whitby, East Whitby and Pickering rural lines, which were - for the period to October 31st, 1920 - charged to the operating costs of the Central Ontario System. In the year ending October 31st, 1921 these deficits were credited back to the System and with a deficit in operations for that year charged as collectible from the municipalities of Whitby, East Whitby and Pickering under the terms of the contracts with them.

As previously mentioned, the Commission under date of March 1st, 1913, entered into a contract with the City of Peterboro, and subsequently and after March 1st, 1916 (the date of purchase of the System by the Province) it entered into other contracts with the municipalities of Bloomfield, Lakefield, Havelock, Marmora, Norwood, Picton and Wellington under the terms of which the municipalities mentioned undertook to pay the costs of power delivered to them including Sinking Funds.

For the period between March 1st, 1916, and October 31st, 1918, the Commission found it impracticable to allocate the costs of operation and maintenance and to apportion the capital invested in the System so as to determine the actual costs of delivery of power to any municipality or power customer, including the municipalities mentioned - this for the reasons that the generating plants of the System were of varied capacities and not so connected as to give a uniform supply of power to the municipalities and other customers or to permit a pooling of generating costs and the equitable distribution of the same. In 1918, however, construction of a loop (or series of tie lines) was completed, connecting the various generating plants of the System along the Trent River, and this permitted the pooling of the costs of all power generated on the System (exclusive of the Nipissing or Northern System). Thereafter and as from November 1st, 1918, the costs of power delivered to municipalities and customers on the System was calculated and apportioned on the following bases:

(a) The investments in the generating plants, the loop or tie lines connecting the same, and in the switching stations thereon, were pooled and interest and renewal charges upon such works were allocated between the municipalities and companies under contract in direct proportion to the amount of power delivered to each of them in the year as compared with the

total amount of power distributed over the System in that period.

(b) All operating and maintenance costs of the generating plants, the loop or tie lines, and the switching stations of the System were pooled and allocated between the municipalities and the Companies under contract in direct proportion to the amount of power delivered to them in the year as compared with the total distributed by the System in the period.

(c) The expenses, costs of operating and renewal charges of the transmission lines radiating from the loop, and the distributing stations thereon - and interest charges on the investment therein - were apportioned between the municipalities and companies taking power therefrom in direct proportion to the amount of power delivered to them in the year as compared with the total distributed over such lines in such period.

Calculated on the above bases the method of determining the cost of power to the municipalities on the Central Ontario System varies to a certain extent from that adopted in respect of the Niagara and other power systems in that

(a) On the Niagara and other power systems the cost - or average cost - of power at the point of its generation or purchase by the System includes the bare cost only of generating or purchasing such power at the point of delivery of the same to the System,
whereas

(b) On the Central Ontario System the cost - or average cost - of power includes the costs of generation at the six development plants - of varied capacities -owned by the System, together with interest and other charges in connection with the tie lines connecting such plants.

Attached as Schedule 89 hereto is a statement showing in detail the costs, excluding sinking funds, of power delivered to the eight municipalities under contract with the Commission and the Town of Whitby for the fiscal year ending October 31st, 1921. Such statement shows the amounts paid in the year by such municipalities and the overpayments or underpayments by each of them.

The costs of power delivered to the eight municipalities under contract with the Commission and the Town of Whitby were also calculated in the same manner for the two years ending October 31st, 1919 and October 31st, 1920, and against the costs so ascertained revenues received from the municipalities - by way of payment of interim monthly power bills - were credited; the balances remaining appear as overpayments or underpayments by such municipalities. The extent to which each of such municipalities underpaid or overpaid in each of the two years ending October 31st, 1919 and October 31st, 1920, is set

out in Schedule 90 hereto, which statement also shows the interest credited to or charged against such municipalities up to October 31st, 1921 - the amounts overpaid or underpaid in respect of power delivered to them in the year ending October 31st, 1921, and the accumulated overpayments or underpayments for the three years ending October 31st, 1921.

In the fiscal year ending October 31st, 1921, the operating costs in respect of rural lines in the Townships of EastWhitby, Whitby and Pickering - which lines are operated at the cost and risk of these municipalities - amounted to $10,741.69. The revenue received from power and light customers of such lines was $8,719.68 and costs exceeded revenue therefore to the extent of $2,022.01 (see Schedule 89). The excess of operating costs over power and light revenue in the whole period to October 31st, 1921, was $10,899.09, which amount is collectible from the Townships of East Whitby, Whitby and Pickering.

Reserve for Contingencies:

As on October 31st, 1920, there remained to the credit of the Reserves for Contingencies account, the sum of $10,763.90
In the fiscal year ending October 31st, 1921,
there was provided out of revenue 27,953.20

a total of $38,717.10
from which there has been deducted the expenditures made in made in the year to cover unexpected losses caused by a fire and a flood at the Healy Falls Generating Plant, of 30,764.49
leaving a balance to the credit of the account as of October 31st, 1921, of $7,952.61.

The amount transferred to the credit of Contingent Fund in the year ending October 31st, 1921, and charged into operating expenses was $27,953.20, equal to approximately 90¢ per horse power as compared with approximately 25¢ per horse power charged in the preceding period. The increase in the amount of the charge for the year was necessary to cover the losses met with at the Healy Falls generating plant.

ROKEN CHERE RIVER STORAGE SYSTEM

BONNE CHERE RIVER STORAGE SYSTEM

Statement of Fact

By agreement dated 8th January, 1912, [1] the Commission entered into an agreement with the Town of Renfrew to build and put in operating condition a storage dam at the foot of Round Lake. The Commission was to bear all the cost of construction and all outlay in connection with the purchase of the necessary lands for flooding purposes and the Town of Renfrew was to make annual payment to the Commission to cover operating and maintenance costs of the dam together with interest at 4% and a sinking fund to repay the cost in 30 years.

By a second agreement dated 2nd April, 1917, [2] the Commission undertook to build a storage dam at the outlet of Golden Lake, the Town of Renfrew agreeing to pay administration, operation, maintenance and insurance charges together with sinking fund instalments sufficient to repay the cost of the dam in 30 years, plus interest at the rate paid by the Commission on the cost of the works. In this agreement there was, however, a proviso that the Town was to be let off payment of such proportion of the total charges as might be assessed against the Renfrew Power Company or other persons using water or benefitting from the storage system.

[illegible] RIVER DIVERSION STUDY

Statement of Fact

By agreement dated 8th January, 1912, [1] the Commission entered into an agreement with the Town of Barrie to build and put in operation generating storage dam at the foot of Round Lake. The Commission was to bear all the cost of construction and all outlay in connection with the purchase of the necessary lands for flooding purposes and the Town of Barrie was to pay annual payment to the Commission to cover operating and maintenance costs of the dam together with interest at 4% and a sinking fund to repay the cost in 30 years.

By a second agreement dated 2nd April, 1917, [2] the Commission undertook to build a storage dam at the outlet of Golden Lake, the Town of Barrie agreeing to pay administration, operation, maintenance and insurance charges together with sinking fund instalments sufficient to repay the cost of the dam in 30 years, plus interest at the rate paid by the Commission on the cost of the work. In this agreement there was, however, a provision that the Town was to be let off payment of such proportion of the total charges as might be assessed against the Barrie power undertaking [illegible] TAVE 1[illegible] [illegible] arising from the storage works.

The capital invested in the works of the System was as on 31st October, 1921, represented by:-

Cost of storage dam at Round Lake	$20,292.68
Cost of storage dam at Golden Lake	11,092.81
Interest on the above expenditures to 31st December, 1916,	2,780.25
a Total of	$34,165.74

For the period January 1st, 1917, to 31st October, 1920, the Commission made apportionment of all operating charges in respect of the works,- including interest and sinking fund- as between six firms and individuals and the Corporation of Renfrew, according to the benefits which each, in the opinion of the Commission, obtained from the use of water from the System. Up to 1921 all of the persons and firms against whom such assessment had been made - excepting the Town of Renfrew - had declined to make payment of such charges. Upon investigation the Commission found that certain of such persons and firms had, for various reasons ceased to operate mills owned by them while the remainder of such persons and firms still refused to share in the cost of operating the Storage System on the ground that they were receiving no greater benefit from the use of the water they were taking than they had received prior to the construction of the Storage dam. In the circumstances

The capital invested in the works of the Trustees was as on 31st October, 1921, represented by:-

Cost of storage dam at Round Lake	$30,202.66
Cost of storage dam at Cullen Lake	11,[illegible]
Interest on the above expenditures to 31st December, 1916.	[illegible]
a Total of	$[illegible]

For the period January 1st, 1917, to 31st October, 1921, the Commissioners were responsible of all operating charges in respect of the works,- including interest and sinking fund- as between six firms and individuals and the Corporation of Renfrew, according to the benefits which such, in the opinion of the Commission, obtained from the use of water from the system. Up to 1921 all of the persons and firms against whom such assessment had been made - except- ing the Tanc at Renfrew - had actually in some manner or some manner[illegible]. Some investigation on Commission found that payment of such charges had been made by the respective persons or companies to Ontario City, except in one small in- stance. In the matter of such persons and firms still refused to share in the cost of operating the Trustees (since in the Commission that they were realizing no greater benefit from the use of the water than were taking them they had received prior to the construction of the storage dam. In the circumstances

the Commission decided that none of the charges(apportioned as above mentioned) were collectible from such persons and accordingly it assessed the Town of Renfrew under the contracts entered into in 1912 and 1917 with the operating charges - including interest and Sinking Funds - for the full period to October 31st, 1920; it also charged Renfrew with the whole of the operating costs, interest and Sinking Fund - amounting to $2,707.33 for the fiscal year ending 31st October, 1921.

Up to October 31st, 1921, the Town of Renfrew had paid such charges to an extent as originally apportioned against it only - and the sum of $5,306.20 remained charged against it on the books of the Commission.

No reserves for renewals or contingencies are set out in respect of the undertaking by Sinking Funds to the amount of $3,194.24 stood established on 31st October, 1921, out of charges included in the costs of operation to that date.(3)

[illegible]

the Commission decided that none of the charges(apportioned as above mentioned) were collectible from such persons and accordingly it assessed the Town of Renfrew under the contracts entered into in 1912 and 1917 with the operating charges - including interest and Sinking Funds - for the full period to October 31st, 1920; it also charged Renfrew with the whole of the operating costs, interest and Sinking Fund - amounting to $2,707.50 for the fiscal year ending 31st October, 1921.

[illegible]

[illegible] out in respect of the undertaking by Sinking Funds to the amount of $3,194.24 stood established on 31st October, 1921, out of charges included in the costs of operation to that date.(R)

Notes

(1) Auditor's report 1918, page 37,

(2) Auditor's report 1918, page 37

(3) Auditor's report 1921, page

Observations and Addenda

THUNDER BAY SYSTEM

THUNDER BAY SYSTEM

TREATMENT OF PAPER

In 1917 the Cities of Port Arthur and Port William entered into the usual form of contract with the Hydro-Electric Power Commission, for a supply of power. (1) Although the contracts came into force in March 1918 when they were ratified by the Legislature, Port Arthur did not begin to take power until December, 1920, and Ft. William will not take power until August 1926. The contracts authorized the Commission to construct or purchase generating stations, transmission lines and any other works required to supply the power, and under the Power Commission Act the municipalities became liable to repay to the Commission the full cost of the works. (2)

Both Cities had previously been supplied with power generated at Kakabeka Falls on the Kaministiquia River, west of Port William, by the Kaministiquia Power Company. (3) The City of Port William has had a contract direct with the Kaministiquia Power Company which does not expire until August, 1926. (4) The City of Port Arthur had had a ten year contract, expiring in April 1920, through the Hydro Electric Power Commission which brought the power from the Kaministiquia Power Company and sold it to Port Arthur (5) The price paid

by Port Arthur for the power was $15 per horsepower at 22,000 volts. In Port William the price of power was $20.00 per horsepower at 2,200 volts. (6)

When the proposal of an agreement with the Hydro-Electric Power Commission was before the ratepayers of the two cities in January, 1917, it was represented by the officials of the Commission that the prices of power under the new proposal would be substantially lower than they had been under the old arrangements with the Kaministiquia Power Company (7). This expectation, and the anticipation of demands for power larger than the Company was able to supply, were the reasons which induced the two Cities to enter into the contracts with the Commission. (8) The alternative was to allow the Kaministiquia Power Company to undertake a further development on the Kaministiquia River, which could have been done at Silver Falls, or Dog Lake, 15 miles above the Company's present plant.

Instead of allowing the Company to develop this power the proposal was that the Hydro-Electric Power Commission should undertake the development; and it was this proposal that was the basis of the agreements between the Cities and the Commission, though the terms of the agreements were broad enough to authorize a development elsewhere in any part of the Province of Ontario, or outside that, they not in terms by the agreements, only those cities. The essential of the terms is contained in the preamble and with the preamble and in the agreements as to

where (9). The evidence is clear, however that no other plan was seriously contemplated by the people of Port Arthur and Port William when the vote was taken, than the Dog Lake Development (10) The estimated prices of power were said to have been based on an estimated capital expenditure of $3,000,000 (11)

Acting under the authority conferred by the agreements the Commission in 1913 undertook the construction of a generating plant at Cameron's Falls, on the Nipigon River, 85 miles north-east of Port Arthur. It was contended, more particularly on behalf of Port William that, as the estimates furnished to the Cities were calculated solely with reference to the Development at Dog Lake, and as the Dog Lake undertaking alone was before the electors when the by-law was voted on, the responsibility for the change in location rested with the Commission; and it may be that the onus is on the Commission to show why the municipalities should be held responsible for the additional expenditure. (12)

According to the report of the Auditors (13) the total net capital investment, as of 31st October, 1921, represented in the Thunder Bay System, was $6,543,305.27 From this must be deducted $66,991.74 (15) the amount standing to the credit of the System on account of sinking fund, etc., set up in respect to the original Port Arthur System. The completion of the works in connection with the present two units of 12,500 horsepower each,

will, according to the estimates, require the expenditure of another $753,963.00 (16) during the present year. The present estimate, and estimated cost to complete the two-unit System will therefore amount to over $7,000,000.

The Revenue credited to the Thunder Bay System for the year ending 31st October, 1921, was $317,790.98. This amount consisted of $175,753.39, charged against the City of Port Arthur for the sale of power at $25.00 per H.P. and a balance of $142,037.57, which had been charged against the Kipigon Fibre & Paper Co. for power sold under a contract for the security of which the Commission holds a bond for $40,000. (17) The actual amount paid by Port Arthur was $146,032.08, which was based on a price of $30.00 per h.p. the monthly statements rendered to the City having been made out at this price (17aa) The final adjusted bill for the year, however, was made out at the rate of $25.00 per h.p. and instead of requiring the City to pay this amount the H.E.P.C. appropriated $29,721.31 (18a) of funds standing to the credit of the City of Port Arthur in respect of over payments for power under the original Port Arthur System. The City of Port Arthur has protested strongly against this course, urging that the money appropriated by the Commission was required by the City to apply on the construction of a new transformer system for the City's distribution plant. It is understood that the matter is

still the subject of negotiation.

The appropriation of the $29,721.51 still left a deficit of $18,708.83 charged against the City of Port Arthur which will in the ordinary course be added, with interest to the charges for the current year. (19b)

Against the present and future deficit, the Commission holds as security funds of the original Port Arthur System as follows;

Reserve for Renewals (sch 39)	$ 41,302.22
Sinking Fund and Interest (sch 38)	21,264.86
Reserve for Contingencies (sch 40)	4,424.66
	$ 66,991.74 (19c)

The money invested in the Nipigon System was borrowed by the Province at various rates averaging over 6% (20). Acting on instructions, the accountants of the Commission last year computed the interest rate both on construction and operation in the Nipigon district at 5% and carried this rate back to cover all advances since the construction of the Nipigon plant was begun. The effect of this was to give the Commission a credit of $77,347.45 (less a small sum of $3,562.04 due to a clerical error which was held in suspense to be deducted during the current year. (21) The full amount of interest for the year ending 31st

October, 1921, at the rates paid by the Government would have been $316,051.22. (22) It will be seen, therefore, that unless the reduction of the rate to 5% was justified or in other words unless the Province is willing to assume the $77,347.45, the net revenue for the year ending 31st October, 1921 was $77,800.36 less than the interest charges alone, exclusive of a further $20,459.90 interest paid on capital account without any provision for operating costs, sinking funds, reserve for renewals or reserve for contingencies. Even on the basis of the 5% rate the total revenue would have fallen $552.91 short of meeting interest charges. (23)

Under the terms of their agreement with the Commission, the municipalities associated in the Thunder Bay System are under obligation to pay for the cost of the system by buying their power "at cost" that is to say, with a provision for sinking fund which would retire the capital cost in forty years (24) To maintain the system on a sound financial basis there must be charged in the price of power not only the cost of operation, and interest on the investment, but charges for sinking fund, a reserve for renewals and a reserve for contingencies. (25)

On the basis of a capital expenditure of $7,000,000.

the annual charges would be roughly about as follows:

Interest (6.2%)	$434,000.00
Sinking Fund (1%)	70,000.00
Reserve for Renewals (2%) if fixed at say	140,000.00
Reserve for Contingencies, (say 25% on 11,000 H.P.)	6,250.00
Operation (1%)	50,000.00
	$700,250.00

or, roughly, 10% of the capital investment (26).

On the basis of the present load of the System, that is to say 11,000 h.p. (27) it will be seen that the cost per horsepower to meet these charges would have to be $63.68 per h.p. and to this may have to be added a charge, estimated at $1.00 per h.p. for water rental which the Province claims (28).

On the basis of the total installed capacity of the plant, namely 25,000 h.p. the price per horsepower to meet these charges would have to be $28.81. This calculation does not allow for any diversity factor, that is to say it does not make any deduction in the rate, having in view the possibility of selling the same power during different parts of the 24 hour period

to different customers; On the other hand it does not make any allowance for the safety factor, that is to say it does not allow for a possible breakdown of one of the two units (29). It would be readily arguable that with an installed capacity of 25,000 h.p. the Commission would not be justified in contracting for a continuous supply of more than 12,500 or at most 15,000 h.p.

The price of power "at cost" therefore, under present conditions would be somewhere between $30.00 and $60.00 per horsepower, a rate which, it is said, would be prohibitive for such industries as the pulp industry, and which would in any case not be sufficiently attractive to justify the expectation of large increases in the demand.

In the meantime charges of $700,000 per year, or more, are running against the System while the income to offset these charges is only in the neighborhood of $400,000 per year. The actual income for the year ending 31st October 1921 was only $140,034.06 (29a) because the $42,037.57 was not collected from the Nipigon Fibre & Paper Co. and $23,721.31 was appropriated out of the sinking funds, etc. standing to the credit of Pt. Arthur.

On the most favorable method of calculation the System is running behind at the rate of over $1,000. per day.

The problem clearly is not merely to find customers for the power which the plant is at present capable of producing -- for that would mean power at prohibitive prices -- but to find sufficient customers to justify a further installation at Nipigon. The dam and other permanent works were so constructed as to provide water for four other generating units of 12,500 h.p. each in addition to the present two units. According to the estimates of the engineers an expenditure of $1,719,000 would be sufficient to install two more units. An additional expenditure of $1,369,000 would install two further units, bringing the total installed capacity up to 75,000 h.p. (30) Allowing for a safety factor it should therefore be possible to produce 60,000 continuous h.p. on a capital expenditure of approximately $10,500,000. (31) Calculating the annual charges at 10% on the capital investment it would bring the price of power to about $16.50 per h.p.

How shall this condition, or something like it, be attained? Can any substantial increase in the load be secured by charging on the basis of the present cost, or even the arbitrary rate of $25.00 (32) proposed? If the power is sold at $25.00 per horsepower, or less, how shall the deficits be met? Shall part of the capital cost be written off; (33) or shall the deficit be met by the Province at

large; or shall the Commission meet it out of the general funds of all the municipalities for which it acts; (34) or shall it be carried by the Province or by the other municipalities in a suspense account charged against the municipalities in the Thunder Bay System? The Cities of Port Arthur and Fort William are vitally interested in the problems not only as affecting the price of power and the prospects of attracting industries, but on account of the responsibility assumed for the capital cost of construction. The brunt falls in the first instance on the City of Port Arthur whose contract with the Hydro-Electric Power Commission is laready in operation. The contract of the City of Ft.William does not come into operation until August 1926. The City of Ft. William is in the meantime purchasing its power from the Kaministiquia Power Co. at a price in the neighborhood of $20.00 per horsepower, at 2200 volts. (35)

Both Cities have interested themselves in exploiting every prospect that has offered of procuring the establishment of industries which would purchase power. The largest single prospect was that of the lessees of the Black Sturgeon and Pic River pulpwood limits.

These limits were leased in 1917 to J. J. Carrick and S. A. Marks, respectively. (36) Marks subsequently

assigned his interest to Carrick. (37) Later, in June, 1919, Carrick assigned his interest in both limits to the Great Lakes Paper Company, Ltd., who are the present lessees. (38) It is understood that from 13,500 to 30,000 h.p. will be required for the purposes of this Company. (39) Negotiations have been in progress since the summer of 1918 over the terms of a contract for the supply of power by the Hydro-Electric Power Commission for the works of this Company. (40) In addition to the price of power, questions were in dispute as to the provisions governing the enforceability of the contract and the security to be furnished by the Company. (41) All of the matters except the question of enforceability appear to have been substantially agreed upon, but the Hydro-Electric Power Commission has stood by certain objections to varying its usual terms of contract with the result that the matter has remained in abeyance. (42).

Discussions had in the meantime also proceeded between the Government and the Company as to the right of the Company to hold its lease, the Company not having constructed its plant within the time specified in the original lease. (43) Pursuant to the terms of their original lease the lessees had been given the right to develop power at Cameron's Falls. Subsequently the Government asked the lessees to give up their right of development at Cameron's Falls and to accept

instead an undertaking on the part of the Government to supply power through the Hydro-Electric Power Commission at cost, and an extension of the time for the completion of their plant until the power was available. (44) This agreement was interpreted by the Government as making it obligatory upon the Company to take power from the Commission, while under the interpretation of the Company the agreement merely gave the Company an option to take Hydro-Electric power while placing an obligation upon the Government to make the power available before the Company could be required to proceed with the construction of its plant. (45) The negotiations between the Company and the Hydro-Electric Power Commission over the terms of the power contract were therefore complicated by the disputes as to the freedom of the Company to procure power elsewhere. This dispute finally came before the Courts in the form of an action by the Attorney-General against the Company. In this action the Company succeeded. (46) It was held that the Company was under no obligation to proceed with the construction of its plant until a sufficient amount of power was available to satisfy its requirements; that if the power was not made available by the Government the right to a lease of an undeveloped waterpower would revive; and that in any event the Company was under no obligation to take

power from the Hydro-Electric Power Commission. (47)

To correct this anomalous situation a new agreement was entered into in February of this year under which the Company, while being free to take its power from sources other than the Hydro-Electric Power Commission, and waiving any right to a lease of an undeveloped waterpower, undertook to complete its plant not later than February 1925. (48)

This leaves the Company still a prospective customer of the Hydro-Electric Power Commission. The Company is ready and willing to enter into a contract on reasonable terms to take an amount of power of from 15,000 to 30,000 horsepower.

The undertaking of a contract with the Great Lakes Paper Company would require the immediate installation of at least two more generating units at Kipigon at an estimated cost of $1,725,000, (50) but the net effect would be to reduce the disproportion between the total capital investment and the total amount of the load and thuss reduce the cost of power.

The objections of the Company to the form of contract which it was asked by the Hydro-Electric Power Commission to sign were generally the following:-

1. The price to be paid for power was excessive;

2. The amount and terms of the security to be given by the Company for the performance of the contract;

3. The provisions respecting interruptions in the delivery and use of power by conditions beyond the control of the parties were not made mutually applicable to the Commission and the Company;

4. The contract was not mutually enforceable, that is to say it could be enforced against the Company but not against the Hydro-Electric Power Commission without a fiat. (51)

As to the first point the parties appear to have been substantially in agreement on the basis of a price of $17.50 per horsepower. (52)

In this connection it should be observed that in the case of an industry like that of the manufacture of pulp, where the cost of power is so large an amount as to be a basic factor, and in which prices are controlled by the competition of other manufacturers who are able to purchase or develop their power at rates which are said in some cases to be as low as $2.00 per horsepower, and where the market for the product is ordinarily by way of long-term contracts for a regular supply, it is of prime importance that the price should be in the first place sufficiently low and in the second place sufficiently constant to insure the stability of the industry. It may indeed be fair to say that any advantage which might be gained in securing a contract for the sale of power at a price unreasonably high would be counterbalanced by

The objections of the company to the form of contract which it was asked to sign were generally the following:-

1. The price to be paid for power was unsatisfactory.

2. The amount of power to be given by the company for the purchase of the contract;

3. The provisions requiring the company to be satisfactory and use of power by consumers beyond the control of the parties were not made mutually binding on the consumers and the company;

4. The contract was not mutually enforceable, and it by it could be enforced against the company but not against the property-owners receiving Consumption without a lease.

As to the first point the written offer to sell was substantially in accordance with the tariff of a price of 12½c per kilowatt-hour.

In this connection it should be remembered that in the case of an industry like that of the manufacture of pulp, which requires of power is so large an amount as to be a "basic factor", and in which prices are controlled by the competition of other manufacturers who are able to generate or develop their power at prices which are not in some cases to be as low as 1½.00 per horsepower, and where the market for the product is continually by way of international competition for a superior article, it is of prime importance that the price should be in the first place satisfactory; and in the second place sufficiently economical to insure the stability of the industry. It may therefore be fair to say that any difference which may be found in accepting a contract for the sale of power as a

the risk that the permanency of the industry and of the contract would be correspondingly jeopardized. It is not so much a question of the price which an individual manufacturer may under any circumstances be willing to contract to pay;- it is rather a question of the price which the industry under competitive conditions can afford to pay. Without treating this as the only factor to be considered it is sufficient to say that it appears to be an important factor. (53)

On the question of price also it is urged on behalf of the Cities of Port Arthur and Fort William, and is obviously reasonable, that the prices offered to industries must be such as afford the greatest possible inducement consistent with sound financing. (54) As for the consideration that the suggested price will not cover all the charges included in the cost of power, it may at once be said that under present conditions these charges are not being met at all but are rapidly accumulating at the rate of per day (55) against the System. It would seem unquestionably better that a part of the charges should be paid than that they should all continue to accumulate. It is fair to put it that by the additional estimated expenditure of $1,725,000. (56) the revenue of the System, if the minimum amount of power called for by the contract were sold, would be increased by $236,150., (57) or more than doubled.

As to the amount and terms of the guarantee, the Company had reached an adjustment of that feature

in its negotiations with the Government.[58] Similarly as to the third objection an understanding appears to have been arrived at with the Government under which the matter would be covered by some form of insurance.[59]

The fourth objection was a more serious one. It was pointed out by the Company that it had already in its dealings with the Commission and the Government experienced the difficulty of securing a fiat to enable it to appeal to the Courts to enforce its contractual rights.[60] It was urged by representatives of the Company that the financial institutions by whom the working capital was to be supplied could not reconcile themselves to taking the risks of another contract which might be similarly unenforceable.[61]

At various junctures from the time the arrangements with the Hydro-Electric Power Commission to furnish power to the two Cities were first discussed the Commission has given the Cities reason to believe that the rates would be the same in the two Cities.[62] Definite assurances to this effect were in fact given at different times, yet at several stages of the negotiations with the Great Lakes Company the Hydro-Electric Power Commission took the position that the price for power at 110,000 volts could not be as low in Port William as in Port Arthur, and that if the Great Lakes Company should locate at Port William or at the "Mission" site immediately west of Port William it would have to pay an additional charge for the transmission of the power from the last pole of the Commission's 110,000 volt line in Port Arthur.[63].

Whatever logic there may be in favor of a differential rate as between the two Cities, whether for high-voltage or low-

voltage power, there are practical and also logical reasons which make it necessary and desirable that there should be the same rate for power, at any voltage, in Fort William as in Fort Arthur. The two cities are too heavily involved and too evenly balanced in their relation to the Nipigon development to permit of any discrimination or favoritism which might militate against their cooperation in working out their common problems.

The above suggestions are made with a view to placing the System as soon as possible on a sound financial basis and to reduce the deficit as quickly as possible to a vanishing point. The Power Commission Act provides that a municipality may be relieved of the Sinking Fund charges for the first five (5) years but "the amounts required from such corporation on a sinking fund account shall be payable during the thenanext ensuing thirty years". The Act as it stands is intended to provide for the ordinary case of a thirty-year sinking fund period and is apparently not sufficient to justify an extension of the forty-year period, which was granted as a special concession to Fort Arthur and Fort William. The reason given for making the period forty years was that Fort William would not be in a position to take power under its contract until 1926 and that Fort Arthur had not completed the sinking fund period in respect of its original contract with the Commission. It is questionable whether, under the law and theory as at present followed by the Hydro-Electric Power Commission, it would be considered proper to grant an extension of the sinking fund period beyond the date fixed by the present agreement and extend the period to, say, 45

years. It is questionable whether it would not be as well to face the deficits at once. It was strongly contended on behalf of both Portarthur and Port William that the Government ought to meet at least that portion of the deficit which arises out of the failure or delay, in getting into operation the pulpwood industry in connection with the Nipiriver and Black Sturgeon limits. The amount of this was placed by the representatives of Port Arthur at $200,000 per year. Various contentions were put forward as to why the municipalities should not be called upon to meet this portion of the deficit.

Notes

(1) See Statutes of 1916 (8 Geo.V,chap.14,Sch."A" Ft. William Agreement; Sch."C" Pt.Arthur Agreement

(2) See Power Commission Act, Secs.22 et seq.

(3) See Statutes affecting Kaministiquia Power Co.-
1897 - Chap. 106
1899 - " 120
1904 - " 106
1910 - " 114.

(4) Copy on file with Ft.William-Pt.Arthur evidence, dated 14th March, 1916.

(5) Dated 13th January, 1910, validated Statutes 1910 (10 Ed.VII, C.114 - Agreement set out as Schedule "D", page 846)

(6) See Morris' statement, para. 1

(7) See Ft.-William-Pt. Arthur evidence page 15; See letter Gaby to Mayor Murphy Dec.30, 1916, quoted on page 14 Ft.W-Pt.Arthur evidence; See Mr. Morris' statement, para 2.

(8) See Ft.William-Pt. Arthur evidence page 71.

(9) See preamble para 2 and Clause "k" of Sec.2 in both agreements, Statutes of 1916, page 84.

(10) See letter Gaby to City Clerk, Ft.William, March 24,1917, quoted in full on pages 19-20 of Ft.William-Pt.Arthur evidence;
See Ft. William-Pt. Arthur evidence page 17;
See letter Beck to Mayor Adamston, March 29, 1922, para 3 (in full in "Summary of H.E.P.C. files on Pt.Arthur and Ft.William re By-Laws")

(11) Ryaro's Nipigon Brief, page 12.

(12) Ft.William-Pt.Arthur evidence pages 18-19-20-31-33-129-130-131

(13) See Report of Clarkson, Gordon & Dilworth, Auditors, for the year ending 31st Oct., 1921, pages 35 et seq.

(1) See minutes of 1918 (B Gen.7,item(1),min.(7)
Pr. William agreement; doc.(C) Inventory
activity.

(2) See Lower Commission ref. Gen.(1) (7) and

(3) See minutes affecting Knightsbridge Lower Co.-
1897 - Chap. 108
1898 - " 190
1904 - " 106
1910 - " 116.

(4) See Pr. William v. Pr.William-Pr.Arthur Railway,
Ontario Law Reports, 1914.

(5) Being the Judgment, 1918, Valuation/Property Inv
(B Co.Vol. 0.116 - 4)
Gundale "B", page 666

(6) See Morris' statement, para. 1

(7) See "Pr.-William-Pr. Arthur evidence page 16;
See letter Gady to Roger Dwight Com.Ad. 1918.
quoted on page 16 Pr.W-Pr.Arthur evidence;
See AT, Morris' Statements, note 6;

(8) See Pr.William-Pr. Arthur evidence page 71.

(9) See procedure para 8 and Clause "M" of sec.3 in
both agreements, December of 1918, page 84.

(10) See letter Gady to City Clerk, Pr.William, March
24,1917, quoted in full on pages 14-40 of
Pr.William-Pr.Arthur evidence;

See Vol. William-Vb. Arthur evidence page 171

See letter Gear to Mayor Cameron, March 29, 1918,
para 3 (in full in "Summary of K.C.A.d. Alice
on Pr.Arthur and Pr.William re Sy-Lawa")

(11) Dyke's Diplom Stmt, page 56.

(12) Pr.William-Pr.Arthur Railway Order 14-16-Railway
Lum-14.

(13) See Gazette of Canada, Vol.2 Sixteenth, Legislt
for the year ending 31st Dec., 1921, pages
32 et seq.

Notes. -2-

(14) Investment in Original System $ 115,452.67
Investment in Nipigon Dev. 6,348,703.45
Interest - Difference between 5% and 6.2% 77,347.45

$6,543,503.57

(15) Auditors' Report 1921, page 36

(16) Auditors' Report 1921, page 37

(17) Auditors' Report 1921, page 39; also Sched. 33

(18) Collected from the City of Pt. Arthur at rate of $25 h.p. $173,783.00

Amount paid in cash $127,324
Surplus on original system applied 29,721 157,045.00

Deficit $ 16,738.00

See Auditors' Report Sched.35

(19) Auditors' Report, Sched. 35

(19a) Auditors' Report, Sched. 37

(19b) By authority Power Commission Act, last page, 8 Geo.V, C.14, S.12
Power Commission Act, Sec.23(a)

(19c) Auditors' Report, Schedules 38-39-40

(20) Auditors' Report 1921, page 37 (bottom)

(21) Auditors' Report 1921, "Interest adjustments", page 37

(22) Total interest paid to Province $254,852.79
Interest on borrowings from Reserve Fund of Commission 1,598.85

Total $256,451.64

Interest for period (Not collected) Difference between 5% and 6.2%:

Added to Capital $20,459.90
Not added 37,139.62 57,599.52

$314,051.02

Notes -3-

(23) Interest paid $258,481.64
interest Adjusted - Difference
between 5% and 6.2% 37,132.68
$295,591.32

Revenue 217,790.96

Difference 77,800.36

Interest deferred 77,247.45

Difference 552.91

(24) See Agreements, Statutes 1918, page 81 et.seq.
Clause "D" of Sec.3

(25) See Power Commission Act, Sec.23

(26) Witnesses at Port Arthur- figured the annual charges at 12% on capital investment.

(27) Auditors' Report 1921, Schedule 36

(28) Water Rentals - (?)

(29) See Page 125, Ft.William-Pt.Arthur evidence.

(29a) Total Revenue (Sched.36(. $217,790.96
LESS
Payable by Nipigon Fibre
(Sched.38) 742,037.57

Applied in part payment
of power bills, Pt.
Arthur (Sched.37(29,771.31 71,753.88
$146,032.08

(30) See Estimate No.35023, Feb.25, 1921, set out in full at page 54, Great Lakes Brief.

(31) See Notes 14 and 15
Total net capital investment $6,543,805.87
Sinking Funds 86,931.74
6,476,513.83

Estimated to complete present
two units (Auditor) 733,968.00
Estimated to add four units,
(Estimate #35023) -
at 5% interest 3,588,000.00
(at 6% would be $3,640,000)

$ 10,798,581.83

Notes -4-

(32) See Ft.William-Pt. Arthur evidence, page 183

(33) do. pages 64, 93, 117

(34) i.e., in the way expenditures on radials were paid

(35) See Note No.5

(36) The Pic River Limit offered for sale by public tender in November,1916, and on December 12th finally awarded to J. J. Carrick.
The Black Sturgeon Limits were offered for sale by public tender in January, 1917, and awarded to S. A. Marks, 6th Feb.,1917 (See S.P.#73)

By letter dated 20th February,1917, Marks advised Deputy Minister Grigg that the Canadian Northern, Sir William Mackenzie and J.J.Carrick were associated with him (S.P.#73)

(37) Formal assignment, Marks to Carrick, dated 8th May, 1917 (S.P.#73) P.10

(38) On June 1st, 1918, Carrick assigned 51/100 share in both limits to Messrs Seaman & Alsted;
On January 23, 1919, Carrick assigned a further 15-2/3 interest to the same parties;
On 22nd March, 1919, Carrick assigned 16-2/3 interest in both limits in both limits to Jas. Shalen
On 29th March, 1919, Carrick assigned remaining 16-2/3 interest in both limits to Messrs. Alsted & Seaman;
On 6th November, 1919, James Shalen assigned his 16-2/3 interest to Messrs. Seaman & Alsted.
(See Bluebook for approval of transfers)

(39) All draft agreements state 13,500 h.p. as minimum amount for initial delivery.
(Agreement No.4 in full, E.B. page 24)

Mr. Alsted stated in his evidence before the Commission that he estimated his plant would require 30,000 h.p. within three years of the date he commenced operations.

Notes

(32) See [illegible], Another evidence, page 165

(33) [illegible]

(34) i.e., in the way experimenters on radials were part

(35) See Note No.3

(36) [illegible] The first [illegible] reported for sale in October 1938, and on November 12th [illegible] formally awarded to G. E. Corporation. The first [illegible] were delivered for sale to public transport in January, 1937, and awarded to G. W. Larkin, 6th Feb., 1937 (See G.E.C.[illegible])

(37) Formal equipment, Series to Service, dated 5th May, 1937 (G.E.C.[illegible]) [illegible]

(38) [illegible] Ibid, [illegible] [illegible] share in both limits to Moscow 3 minutes On January 22, 1936, Service equipment 2 [illegible] 12-E\2 increases to the same periods; On 5th March, 1936, Service equipment 12-E\2 increases in both limits in [illegible] 12-E\2 increases in both limits to one, [illegible]

On 27th March, 1937, Service equipment [illegible] 12-E\2 increases in both limits to Moscow. Listed 3 seconds;

On 6th November, 1939, Jewel Sheldon equipment 12-E\2 [illegible] (See Minutes for equipment of [illegible])

(39) 12-Stage-equipment [illegible] 1937 [illegible] equipment for initial [illegible].

(40) [illegible] Ibid, [illegible] 341

[illegible] Ibid, [illegible] [illegible] be commenced operations.

Notes -5-

(40) Prior to this date Marks and Carrick had both made application for Hydro power. On 26th March, 1917, Mr. Keefer wrote to Sir Adam Beck, on behalf of Mr. Carrick, applying for a supply of power, and on 11th May, 1917, Sir Adam Beck wrote Carrick, stating:

"THE LOWEST PRICES THE COMMISSION CAN JUSTIFY ARE $15 PER H.P. AT 110,000 VOLTS, OR $15.50 FOR SAME AMOUNT OF POWER DELIVERED AT 2300 VOLTS."

(See B.B., page 91)

(41) See letter, Alsted to Bowman, Feb.21,1920 (B.B.52); See Ft.William-Pt. Arthur evidence, pages 82 and 87; See Matthews' letter 17th March, 1920,- page 27 Brief on Great Lakes Paper Co; See Mr. Alsted's evidence.

(42) See Beck's cable to Gaby, 11th January, 1920:
"SEE LUCAS ABOUT GREAT LAKES AGREEMENT. PRINCIPLES FIXED BY COMMISSION UNALTERABLE. IF NECESSARY HOLD AGREEMENT MY RETURN."

See Beck's cable 12th January, 1920 to Lucas:
"GREAT LAKES COMPANY MUST FURNISH GUARANTEE BOND. PROTECT COMMISSION BEHALF MUNICIPALITIES. GOVERNMENT CANNOT ASSUME RESPONSIBILITY. CANNOT FINAL SETTLEMENT AWAIT MY RETURN."

See evidence of Mr. Alsted.

(43) Agreement dated 9th May, 1917 set out in full at page 17 of Blue Book

(44) See letter 22nd February, 1917, Marks to Grigg, asking that lease of waterpower be expedited; referring to understanding with Minister of Lands, Forests and Mines that lease of Cameron's Falls site should go to successful tenderer of the Pic Limits (B.P. No.73, p.9)

See letter Hearst to Carrick, March 27,1917, B.B.72;
See letter Ferguson to Carrick, March 27, 1917, page 89, Blue Book;
See letter 5th October, 1917, Beck to Hearst, protesting against handing Nipigon over to private interests (Page 37, Great Lakes Brief);
See letter 15th October,1917, Hearst to Beck, in answer to Beck's letter 5th October;
See Great Lakes Brief, pages 159-160

Notes -6-

(43) See Judgment, Attorney-General of Ontario vs. Great Lakes Paper Company, Ltd.;
See letter 27th October, Garrick to Hearst (in full in chronological sketch, Great Lakes Brief);
See Opinion of Messrs. Kilmer, MacInnes & Robinson, counsel for the Province, as to Company's obligations;
See letter dated 6th January, 1920, from H. H. Haney to Mr. Keefer, quoted in full in Ft. William-Pt. Arthur evidence, pages 108-9

(46) On 25th March, 1920, the last conference between the Government, the H.E.P.C. and Alsted broke up without parties coming to an agreement;
On 26th March, 1920, Premier Drury wrote Peck advising him that the Government had decided not to take any steps in the negotiations other than those approved by the H.E.P.C. (See Great Lakes Brief, page 144);
12th April, 1920, Mr. Hellmuth wrote Premier Drury requesting a fiat;
20th April, 1920, Mr. Hellmuth wrote Mr. Haney repeating his request for a fiat;
22nd April, 1920, Mr. Haney wrote Mr. Hellmuth repeating that the Government is likely to take action if development work was not undertaken immediately. (Hydro File 2X 1401-2);
10th May, 1920, Conference between Cabinet and Messrs. MacInnes, Kilmer & Robinson, with regard to advisability of taking action against the Company;
12th May, 1920, Messrs. Kilmer, MacInnes & Robinson submit a joint Opinion advising the Province to take immediate legal proceedings to compel the Company to take its power from the Govt;
14th May, 1920, Mr. Haney instructed Mr. Kilmer to institute proceedings against the Great Lakes Paper Company;

26th May, 1920 - Writs issued.

10th June, 1920 - Statement of defence filed;

10th March, 1921 - Hon. Mr. Justice Rose delivered judgment in re Attorney-General of Ontario vs. The Great Lakes Paper Co., dismissing action;

15th March, 1921 - Letter from Mr. Kilmer to Mr. Haney, setting out his interpretation of the judgment - (See extract of letter in Nipigon Brief, page 19).

Notes -7-

(47) See Judgment;
See Kilmer's letter 15th March, 1921

(48) Agreement set out in full page 116, Great Lakes Brief;
See letters exchanged between Alsted and Bowman 8th March,1922, pages 125-6 St. Lakes Brief;

(49) Examine Mr. Alsted as to this.

(50) See Estimate #350223, Feb. 28, 1930, pages 55-61 Great Lakes Brief.

(51) See following letters, written by Mr. Alsted or his solicitors on behalf of the Company:

6th December, 1919, Alsted to Beck, objecting to Agreement No.1 as submitted to him (B.B. 33);
12th January, 1920, letter Lesher to Bowman, setting out objections to Agreement No.3 (B.B. 38);
11th February, 1920, letter Lesher to Bowman (B.B. 60)
21st February, 1920, Alsted to Bowman, setting out his understanding of decisions reached at the conference 12th February (B.B. p.65);
26th February, 1920 - Alsted to Bowman setting out his objections to proposed power contract, (Blue Book p.66);
28th April, 1920, Alsted to Drury, setting out in full the views of his Company in regard to the points at issue (Pages 145-152, Great Lakes Brief);
See evidence of Mr. Alsted;
See evidence of Mr. Morris, pages 81-83, Ft.William-Pt. Arthur hearings.

(52) See Agreements Nos. 1,2,3, set out at pages 72,91, 103;
See letter 17th March,1920, Matthews to A.P.P.C., set out in full at page 27 of Great Lakes Brief;
See Note No.51.

(53) Examine Mr.Alsted, Mr. Morris, Gaby and possibly an independent expert.

(54) See Ft.William-Pt. Arthur evidence, pages 81-83-134

(55) See Auditors' Report, 1921, Page 35.

(56) See Note No.30

Notes -8-

(57) $17.50 x 13,500 = $236,250.00
Present Revenue..... $217,790.96

(58) See letter Alsted to Bowman Feb. 21, 1920 at bottom of page 63, B.B.

See Sec.11 of Agreement No.4 starting bottom page 29, B.B.

(59) See letter 17th March, 1920, Matthews to H.E.P.C. on page 27 of Great Lakes Brief.

(60) See request of Mr. Kellmuth on behalf of Company for a fiat on 12th and 20th April, 1920.

(61) Examine Mr. Alsted, Sir Adam Beck and expert banker (?)

(62) See evidence of Mr. Morris, Ft.William-Pt.Arthur Hearings, page 57 et seq;
See reasons at bottom of page 58;
See Mayor Adamston's evidence in Ft. William-Pt. Arthur hearings, page 77;
See evidence Mr. Inglis, page 161 of Ft.William-Pt. Arthur hearings;
See evidence Colonel S. W. Ray, page 191 of hearings;
See letter Beck to Nixon, 3rd Dec. 1919, advising: "PURSUANT TO THE INTERVIEW HAD WITH THESE GENTLEMEN THEY WERE ADVISED THAT THE PRICE OF POWER TO THE GREAT LAKES COMPANY WOULD BE THE SAME IF SUPPLIED TO EITHER OF THE LOCATIONS SUGGESTED."
(See Great Lakes Brief, page 140);
See statement of Mr. Aspenschied in Ft.William, in December, 1916, as quoted on page 11 et set., Ft.William-Pt. Arthur hearings.

(63) See evidence of Mr. Alsted;
See correspondence between Gen. Hogarth, Mr. Gaby and Mr. Pope, pages 21-2-3-4, Great Lakes Brief;
See Mr. Pope's memorandum, re conference of Dec. 15th,1919, pages 141-2 Great Lakes Brief;
See estimates prepared under supervision Chief Engineer, pages 34 et seq. Gt. Lakes Brief.

(64) See evidence in Ft. William-Pt. Arthur hearings, pages 55-85-86-194.

THUNDER BAY SYSTEM

Observations and Addenda

		Page
1.	[illegible]	[illegible]
2.	[illegible]	[illegible]
3.	[illegible]	[illegible]

S E V E R E S Y S T E M

SIMCOE RIVER

Statement of Fact

On the 10th February, 1911, the Hydro-Electric Power Commission entered into a contract with the Simcoe Railway & Power Co. of Midland for a supply of power for the towns of Penetang and Midland. This contract called for an initial delivery of 200 h.p. and additional blocks of 100 h.p. until the total amount so reserved had reached 1600 h.p. The price for power was to be:

for first	200 h.p. -	$21.00)	per horsepower per annum
	500 h.p. -	20.00)	at 2200 volts;
	1000 h.p. -	19.00)	$1.00 less for all power
	1500 h.p. -	17.50)	at 22,000 volts.

The agreement was to remain in force for 10 years and was renewable thereafter for two terms, one of five years, and the next terminating 10th September, 1929, the date upon which the Company's lease with the Crown would have expired. (1)

The plant of the Simcoe Railway & Power Co. was located at Big Chute, nine miles from the mouth of the Severn River, in Muskoka District.

In 1914 the Company was taken over by the Hydro-Electric Power Commission, the transfer being effective as of 1st July, 1914. (2) The gross purchase price was $677,853.38. (3)

Up to 31st October, 1921, the total capital investment (including purchase price, replacements and additions) was $1,403,847.24, the items being as follows:

Agreement

On the 10th February, 1911, the Ayr-Kilmarnock Power Generation entered into a contract with the Glasgow Railway & Power Co. of Midland for a supply of power for the towns of Newtown and Middland. This contract called for an initial delivery of 800 h.p. and additional block of 100 h.p. until the total amount so reserved had reached 1800 h.p. The price for power was to be:

For first	800 h.p. - £14.00	per horsepower per annum
	900 h.p. - £0.00	at 2500 volts
	1000 h.p. - £3.00	£1.00 less for all power
	1800 h.p. - £7.50	at 22,000 volts.

The agreement was to remain in force for 10 years and was renewable thereafter for two terms, one of five years, and the next succeeding 10th anniversary. The new rate which the Company's lease with the Crown would have expired.

The plant of the Glasgow Railway & Power Co. was located at Elm Grove, miles miles from the mouth of the River Ilver, in Newton Mainish.

In 1914 the Company was taken over by the Ayr-Electric Power Generation, the transfer being effective as of 1st July, 1914.(2) The gross purchase price was £477,424.44.(3)

Up to 31st October, 1921, the total capital investment (including purchase price, replacements and additions) was £1,405,347.24, the items being as follows:

In Power Development	$652,252.43
In Wood Pole Line	569,977.42
In Distribution Stations	184,563.37
	$1,406,793.32

The main transmission line is 198 miles long and conveys power at 22,000 volts. The System is tied into the Eugenia System at Collingwood and also to the Vassell System at Orillia.(4)

During the year ending 31st October, 1921, 4572 h.p. was generated at the development at Big Chute, while in addition 423 h.p. was supplied by the Vassell and 44 h.p. by the Eugenia Systems.(5)

The Annual Report of the H.E.P.C. for the year ending 31st October, 1921 shows the following 17 municipalities comprising the System:

Alliston	Barrie	Beeton
Bradford	Coldwater	Collingwood
Cookstown	Creemore	Elmvale
Midland	Penetang	Stayner
Pt. McNicoll	Thornton	Tottenham
Victoria Harbor	Waubaushene	

It also includes in the list of municipalities Camp Borden and the C.P.R. elevator at Port McNicoll, these two being supplied under special contracts apart from the municipalities in which they are situated. There is also one rural line in connection with the System, in the Township of Nottawasaga, from Collingwood to Duntroon.

During the year ending 31st October, 1920, $21,640.87 was expended upon power development, pole lines

and distributing stations. The sum of $50,000 was appropriated by the Legislature for the purposes of the System during the fiscal year ending 31st Oct., 1920. An additional $7,000 was secured under special warrant, making a total of $57,000 paid over to the Commission. The expenditures being only $31,640.87, $25,359.13 remained in the hands of the Commission for the purposes of the System. This balance was expended in connection with other Systems.[6]

During the year ending 31st October, 1921, $25,272.00 was invested in the works of the System.[7]

Reserves for Renewals are provided on a 4½% straight line basis and all municipalities upon the System have been charged with their share of this reserve.[8]

Six municipalities which had been taking power for less than 3 years in the System were relieved from paying sinking fund charges for the year ending Oct. 31, 1921; the remainder paid proper sinking fund charges. The total Sinking Fund accumulated to 31st Oct., 1921 amounted to $59,961.22.

Prior to the year ending 31st October, 1920, a deficit of $20,342.17 has accrued as a charge against the municipalities of the System. The year ending 31st Oct., 1920 saw a further $11,408.69 added to this amount, while the year ending Oct. 31, 1921 saw the accumulated deficit

increased by $21,519.09, reaching a total of $52,469.94.

SEWERS SYSTEM

Notes. -

(1) T. E. P. C. Annual Report 1911, page 14

(2) E. E. P. C. Annual Report 1914, page 97

(3) T. A. P. C. Annual Report 1914, page 97

(4) E. E. P. C. Annual Report 1917, page 98

(5) Auditors' Report, 1921

(6) Auditors' Report, 1920

(7) Auditors' Report, 1921

(8) Auditors' Report, 1921

N.B. - Where not otherwise noted material is based upon Auditors' Report for year ending 31st October, 1921.

(1) K. E. P. O. Annual Report 1911, page 16

(2) K. E. P. O. Annual Report 1914, page 97

(3) K. E. P. O. Annual Report 1916, page 97

(4) K. E. P. O. Annual Report 1917, page 98

(5) Annual Report, 1919

(6) ANDERSON' REPORT, 1920

(7) Auditors' Report, 1921

(8) ANDERSON' REPORT, 1920

SEVERN SYSTEM

Observations and Addenda

1 - The accumulated deficit on the System has now reached a total of $82,465.94, or more than 25% of the total revenue of the System for the year ending 31st October, 1921.

In connection with the Wasdell System it is observed that the purchase by the Severn System of 423 h.p. at a cost of $29.23 represented 30% of the revenue of the Wasdell System. The corollary should be observed, however, namely that the Severn System had to pay $12,364.29 to the Wasdell System,--the cost of 423 h.p. at $29.23--which payments no doubt contributed largely to the $31,319.08 which was added to the accumulated deficit last year.

2 - Attention is drawn to the fact that in the fiscal year ending 31st October, 1921 the Severn purchased power from -

(a) Wasdell System to the extent of 423 h.p. at the cost of generation and transmission, which amounted to $29.23 per h.p.

(b) From the Eugenia System, 45 h.p., at a flat rate of $28.00 per horsepower.

W A S D E L L S Y S T E M

WASDELL SYSTEM

Statement of Fact

Early in 1912 the Hydro-Electric Power Commission at the instance of a number of municipalities in Ontario County made an investigation of the possibilities of developing a supply of power for the district, and as a result of the report the municipalities of Beaverton, Cannington, Woodville, Sunderland and Brechin passed enabling by-laws in November, 1912.

After a further survey of the district it was decided to develop a generating plant at Wasdell's Falls, on the Severn River, three miles below Lake Couchiching, where there was an available drainage area of 2074 square miles and a possible head of 18 feet. The construction was commenced under the authority of an Order-in-Council dated 21st April, 1913, and was completed in September, 1914.[1]

The plant operates in parallel with the Orillia plant at Swift Rapids and with the Severn and Nagenia Systems. It does not depend on the storage water for its continuous maximum output, and power may be used to maximum capacity of this plant throughout the day so as to permit the other generating plants in the district to increase their water storage. Power is transmitted over a low tension pole line 46 miles in length, at 22,000 volts.[2] For the year ending 31st Oct., 1920 approximately 910 h.p. was generated of which 497 h.p. was delivered to the Severn

Abstract of text

Early in 1912 the Hydro-Electric Power Commission at the instance of a number of municipalities in Ontario County made an investigation of the possibilities of developing a supply of power for the district, and as a result of the report the municipalities of Beaverton, Cannington, Woodville, Sunderland and Prospin passed enabling by-laws in February, 1913.

After a further survey of the district it was decided to develop a generating plant at Bradwell's Mills, on the Black River. Dams and other data demonstrating there was an available drainage area of 2074 square miles and a possible head of 15 feet. The construction was commenced under the authority of an Order-in-Council dated April, 1913, and was completed in September, 1914.[1]

The plant operates in parallel with the Utilities plant at Port Perry and with the Toronto and Niagara Systems. It does not depend on the storage water for its continuous maximum output, and power may be used to maximum capacity at this plant throughout the day so as to permit the other generating plants in the district to increase their water storage. Power is transmitted over a low tension pole line 60 miles in length, at 22,000 volts.[2] For the year ending first cost, 1920 approximately 210 h.p. was available of which 47 was the minimum in the Toronto

over connecting lines.[3] During the year ending 31st Oct., 1921, 962 h.p. was developed and 423 h.p. delivered to the Severn System.

The System now includes the original five municipalities and the municipality of Kirkfield which began taking power in 1920, as follows:

Beaverton	Brechin
Cannington	Kirkfield
Sunderland	Woodville [4]

There is also a system of rural lines in Brock Township, and the municipalities of Beaverton, Brechin and Woodville also have branch rural lines.[5]

The total load on municipalities, in horsepower:

October,	1920	451.6
"	1921	392.7 [4]

According to the Auditors, the capital invested in the works of this System on 31st October, 1921 was as follows:

In Power Development	$141,384.68
In Wood Pole Lines	154,188.77
In Transformer Stations	25,909.62
On Rural lines	12,399.15
A total of -	$335,382.22

Of the above total $55,899.38 was expended during the year ending 31st Oct., 1920, and $2,435.07 during the year ending 31st Oct., 1921 for the purpose of betterments and extensions.

For the fiscal year ending 31st Oct., 1920, the

east Kennedyville line.[7] During the year ending 31st Oct., 1921, 952 R.P. was developed and 498 R.P. delivered to the Seven System.

The power and mileage in original rural municipalities and the municipality of Kirkfield which began taking power in 1920, are as follows:

Beaverton	Greenbank
Cannington	Kirkfield
Sunderland	Woodville (8)

There is also a system of rural lines in Brock Township, and the municipalities of Beaverton, Lindsay and Uxbridge also have rural lines.[9]

The total load on municipalities, in horse-power:

1920	1921
2,[illegible]	1[illegible].7
1[illegible]	2[illegible].7 (9)

According to the auditors, the capital invested in the works of this System on first October, 1921 was as follows:

In Power Development	[illegible]
In Wood Pole Lines	1[illegible],177
In Transformer Stations	34,[illegible]
On Rural Lines	[illegible]
	[illegible]

Of the above total [illegible] was expended during the year ending 31st Oct., 1921, [illegible] during the year ending 31st Oct., 1921 for the purpose of betterments and extensions.

For the fiscal year ending 31st Oct., 1920, the

sum of $90,000 was appropriated by the Legislature for the purposes of this System, and of such appropriations sums aggregating $50,000 were paid over to the Commission for the purposes of the System, as against which was expended:

Upon works proper of the System	$55,899.38
Upon Rural Lines	3,583.56
	$59,482.94

the excess of expenditures over receipts ($9,482.94) having been provided out of amounts in the hands of the Commission available for other Systems.(3)

For the fiscal year ending 31st Oct., 1921 the sum of $75,000 was appropriated by the Legislature for the purposes of the System and of such appropriation sums aggregating $25,000 were requisitioned by, and paid over, to the Commission. Out of such advances the Commission expended on works of the System $2,435.07, leaving $22,564.93 in its hands, which amount is returnable to the Province.

To 31st Oct.,1919, reserves for renewals of works were provided by an annual charge of 3½% on the capital invested, plus interest at 4%, making a renewal rate of approximately 5% on a straight line basis.

On the advice of its engineers "the Commission during the fiscal year ending 31st Oct.,1920, reduced the renewal from 3½% per annum to 2% per annum on the capital investment in the works, which rate with interest added thereto at 4% per annum was equivalent to approximately 3% per annum on a straight line basis."(5) "The accounts

sum of $20,000 was appropriated by the Legislature for the purposes of this System, and of such appropriations were aggregating $80,000 were paid over to the Commission for the payment of the expenses of equipment which may subsequently

Upon works proper of the System	$56,000.00
Upon rural lines	7,433.34
	$63,433.34

the excess of expenditures over receipts ($3,433.34) having been provided out of amounts in the hands of the Commission available for other systems.[3]

For the fiscal year ending 31st Oct., 1921 the sum of $71,000 was appropriated by the Legislature for the purposes of the System and of such appropriation sums aggregating $18,000 were previously by, and that year, to the Commission. Out of such advances the Commission expended on behalf of the System $1,121.67, leaving balance in its hands, which amount is accountable to the Province.

To 31st Oct., 1919, reserves for renewals of works were provided by an annual charge of $12 on the capital invested, plus interest at 4%, making a renewal rate of approximately 4% on a straight line basis.

On the basis of its annual report for the year ending the fiscal year ended 31st Oct., 1920, showing the revenue from 3½% for water on the capital investment in the system, which was with interest sinking charge at 4% for renewals was approximately 4% on a straight line basis.[4] The expenses

of the Commission were revised so as to make the 2% rate effective as from the commencement of operations in 1914."[6] (Mr. Clarkson verbally admitted that when such a reduction is made by the H.E.P.S. it is made for the purpose of reducing the cost of power to the municipalities)

Sinking funds were charged against five of the municipalities while the sixth remained relieved on account of not having taken power for a period of five years, under Sec. 23 of the Act, during the year ending 31st Oct., 1920. The sinking funds payable by such municipalities amounted to $2,655.27, while the amount collected from companies in respect of the works and equipment serving was $2,640.25.[8] The total provision for sinking fund to 31st Oct., 1921 was $11,169.51.

For the fiscal year ending 31st Oct.,1920 the Operating Account showed a net deficit of $1,087.03, being the difference between the sums paid and the costs of power supplied to the municipalities in the year. The total costs of operation were $39,746.74. To meet this amount $20,563.06 was collected from municipalities, $17,313.95 was derived from power sold to private companies and to the Severn System. The balance, $832.70 was written off against Contingency Reserve and marked "Loss on Sale of Power to Private Companies."

During the year ending 31st Oct., 1921, the revenue ($44,577.67) exceeded the cost of power, including

charges ($42,392.18) by $2,158.49.

During the period 425 h.p. was supplied to the Severn System "at cost" --approximately $29.23 per horse-power--hence over 30% of the revenue of the System was derived by its sale of power to the Severn System.

"A loss of $2,515.10 met with on sales of power to companies was distributed over, and included in, the cost of power to the municipalities."(7)

The deficit which has accumulated each year since 1914 had mounted to $20,483.54 as of 31st October, 1920. Last year (ending 31st Oct.,1921) the accumulated deficit was reduced to $19,117.39.

WASHELL SYSTEM

Notes -

(1) H.E.P.C. "Bulletin" Aug., 1913

(2) H.E.P.C. Annual Report, 1920, Vol.1, P.125
do. 1919, Vol.1, P.viii

(3) Auditors' Report, 1920, P.26

(4) H.E.P.C. Annual Report, 1921, Vol.1, P.73-4

(5) Auditors' Report, 1920, page 27

(6) Auditors' Report, 1921, page 48

(7) Auditors' Report, 1921, page 49

N.B. - Where not otherwise noted material is based upon Auditors' Report for year ending 31st October, 1921.

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[1] "Ro-Ro's Thailand" Como, 1970

[2] "Ro-Ro's Guide to Bangkok" Como, 1972, Tokyo Guide Co.

[3] Asiaweek Report, 1980, p.34

[4] Ralph Do Samos Report, 1981, vol.1, Tokyo

[5] Asiaweek Report, 1980, page 37

[6] Cultural Report, 1982, page 61

[7] Asiaweek Report, 1981, page 47

WASDELL SYSTEM

Observations and Addenda

1 - Cost of Power

Last year the municipalities in this System paid over $30 per h.p. because the Severn System paid $29.25 per h.p. and the municipalities overpaid this figure sufficiently to create a credit charge of $2,185.43 in total payments of $32,213.29.

2 - Population

The populations of the original five municipalities is given by the H.E.P.C. "Bulletin" (Dec.,1921) as follows:

Beaverton	949
Cannington	838
Woodville	434
Sunderland	570
Brechen	225
	3016

Kirkfield added in 1920, - 138

These municipalities with a population of 3154, using less than 400 h.p. annually, are responsible for a capital investment of $322,983.07, or over $100 per capita.

Although the H.E.P.C. show 11,150 as the total population of the municipalities in the System, this figure includes all townships served by rural lines where the total investment to date is only $12,399.15

3 - Extract from H.E.P.C. "Bulletin" Aug.1915.??

"The completion of the Wasdell's Falls plant marks the inauguration of a new era in the history of the Commission under which the policy of 'power at cost' is capable of still further expansion; not only by transmitting power at cost but by producing cheap power through the development and conservation of the natural water powers thus securing the utmost economic benefit of municipal ownership."

3 - Deficit

The deficit of $19,483.34 is equivalent to $6.50 per capita of the six municipalities responsible for its liquidation.

O T T A W A S Y S T E M

OTTAWA SYSTEM

Statement of Fact

The City of Ottawa is supplied with power by the Hydro-Electric Power Commission. The power so supplied is purchased by the H.E.P.C. under contract from the Ottawa & Hull Power & Mfg. Co., and distributed over the transmission lines of the old Consumers' Electric Co. purchased by the City at a cost of about $250,000 in the year 1905.[4] The plant of the Company is located on the Ontario side of the river at Chaudiere Falls. The present contract between the H.E.P.C. and the City of Ottawa was executed on the 2nd February, 1914,[1] and that between the H.E.P.C. and the Company on the 8th December, 1913.[2] During the period ending 31st October, 1921, approximately 7554 hp:. was used at the rate of $13.50 per h.p.[3]

Prior to 1901 the Ottawa Electric Co. had a monopoly of the electric business in Ottawa. In 1901 the City gave a franchise to the Consumers' Electric Co., which began to compete with the Ottawa Electric Co. in 1903. In 1904 the Ottawa Company proposed to absorb the Consumers' Company and introduced a private Bill to secure the necessary authority. Before the Bill was finally passed the City exercised its right under the franchise given to the Consumers' Company and in 1905 bought out the plant of that Company, which was a distributing plant only. The

Chapter Three

Generation of Power

The City of Ottawa is supplied with power by the Ogden-Electric Power Commission. The power so supplied is generated by the G.N.R. water development at the Chaudière Falls by the Ottawa & Hull Power & Mfg. Co., and distributed over the transmission lines of the via Commission' Electric Co. purchased by the City at a cost of about $200,000 in the year 1902.(4) The plant of the company is located on the Ontario side of the river at Chaudière Falls. The present contract between the H.E.P.C. and the City of Ottawa was executed on the 2nd February, 1914,(1) and that between the H.E.P.C. and the Company on the 6th December, 1913,(2) during the period during which Hydro Electric, Ltd. operationally 75% kw. was used at the rate of $13.50 per h.p.(3)

Prior to 1901 the Ottawa Electric Co. had a monopoly of the electric business in Ottawa. In 1901 the City gave a franchise to the Consumers' Electric Co., which began to compete with the Ottawa Electric Co. In 1905, the Ottawa Junior Employed to absorb the Consumers' Company and introduced a private Bill to secure the monopoly authority. During the Bill was finally passed the City Executive the right under the franchise given to the Consumers' Company and in 1912 bought out the plant of that Company. This has a distributing plant only. The

Ottawa Electric Company immediately took action to prevent the operation of the distributing plant of the Consumers' Co. by the City on amongst other grounds that the City had no authority to purchase the power as it proposed to do from the Ottawa & Hull Power & Mfg. Co. The City won in the first courts but lost by three to two in the Court of Appeal, and the agreement which the City had made with the Power Company was set aside.[4]

The City at once applied to the H.E.P.C. for a supply of power and after considerable negotiations the Commission entered into a contract for power with the Ottawa & Hull Power & Mfg. Co. dated 31st July, 1907. On the day of July, 1907, the City of Ottawa entered into the usual agreement with the Commission for the supply of such power.[5]

The first agreement between the Commission and the Company was amended by a further agreement dated 6th December, 1910.[6] As noted above, the present contract between the H.E.P.C. and the Company which supersede the two earlier agreements, was executed on the 2nd February, 1914,[1] the amounts of power held in reserve under said agreements having proved unequal to meet the demand.

Under this agreement the Company agrees to "reserve and deliver at the earliest possible date 3,000 h.p."

and on 30 days' notice to deliver additional power in blocks of 500 h.p. up to 20,000 h.p. The Commission agrees to pay for the power at the following rates:

For 5,000 h.p.	taken or	held in reserve	$14.00)	
8,000 h.p.	"	"	"	13.50)	per
10,000 h.p.	"	"	"	13.00)	h.p.
12,000 h.p.	"	"	"	12.50)	per
14,000 h.p.	"	"	"	12.00)	annum (2)
15,000 h.p.	"	"	"	11.50)	
16,000 h.p.	"	"	"	11.00)	

11,000-volt power

The agreement is to remain in force for 12 years with the privilege of renewal by the Commission, on notice, for one or two further consecutive terms of ten years each.

The total capital investment of the H.E.P.C. in the System as of 31st October, 1921 was $5,707.07, which is represented by -

Metering Equipment, etc	$1,009.57
Rural Lines in course of construction	4,697.50
	$5,707.07

No appropriation was made by the Legislature to cover capital construction on the System and the expenditure of $4,697.50 was made by the Commission during the year ending 31st October, 1921, out of cash advances from the Province under appropriations for miscellaneous constructions.

The engineers of the Commission, according to the Auditor, expect to construct Rural Lines this year at a cost of $60,000.

and in 20 days' notice in daily-use additional power in blocks of 500 h.p. up to 50,000 h.p. The Commission agreed to add the power on the following scale:

5,000 h.p.	"	"	"	15.00
10,000 h.p.	"	"	"	15.00
12,000 h.p.	"	"	"	15.00
14,000 h.p.	"	"	"	15.00
15,000 h.p.	"	"	"	15.00
16,000 h.p.	"	"	"	15.00

11,000-volt power

The agreement is to remain in force for 15 years with the privilege of renewal by the Commission, on notice, for one or two further consecutive terms of ten years each.

The total capital investment of the Ontario, in the System as of 31st October, 1911 was $8,707.07, which is represented by -

Capital stock issued to Municipalities	$4,000,000
Surplus earned to October 31st 1911	4,707.07
	$8,707.07

An appropriation was made in the legislature in view of capital requirements of the system and the expenditure of $147,50 was made by the Commission during the year ending 31st October, 1911. out of cash advances from the Province under appropriations for miscellaneous constructions.

The earnings of the Commission, according to the auditing report in question, based first this year of a sum of 7,000,000.

OTTAWA SYSTEM

The total amount collected by the H.E.P.C. from the City of Ottawa for the year ending 31st October, 1921, was $104,087.62, which was divided as follows:

Power purchased	$103,329.02
Operating Expenses	559.94
Interest on Capital investment	50.48
Provision for sinking fund	18.18
	$104,087.62

OTTAWA SYSTEM

Notes -

(1) 4 Geo.V, chap.15, P.109

(2) H. E. P. C. Annual Report 1914, page 39

(3) Auditors' Report, 1921, page 55

(4) See letter Ellis and Hopewell to Beck, dated 3rd September,1908, printed in full in H.E.P.C. Annual Report, 1909, page 118

(5) 1907 agreement between H. E. P. C. and Ottawa & Hull Power & Mfg. Co. set out in full at page 113, H.E.P.C. Annual Report,1909

Agreement between City of Ottawa and Commission at page 110, same report.

(6) 1910 agreement set out in full in H.E.P.C. Annual Report, 1911, page 11

N.B. - Where not otherwise noted material is based upon Auditors' Report for year ending 31st October, 1921.

WORKS CITED

Notes:-

[1] A Gen.V, Vaqgeli, 1-1[illegible]

[2] G. W. P. G. Annual Report 1[illegible], page [illegible]

[3] Ministry Survey, 1971, page [illegible]

[4] The Water Cities and Commercial by [illegible], David Gre Gre[illegible], printed in [illegible] in N.E.W. Sewer Report, 1[illegible], page 1[illegible]

[5] 1[illegible] agreement between G. [illegible] and [illegible] & Mail Power & Mfg. Co. not out in full at page 114, V.G.V.V. Annual Report,1[illegible]

Agreement between City of [illegible] and [illegible] at page 110, same report.

[6] 1[illegible] agreement not out in full in N.E.G.C. Annual Report, 1[illegible], page 11

Fig. - Items not otherwise noted emanated in [illegible] from Ministry Report for year [illegible] Ministry, 1[illegible].

OTTAWA SYSTEM

Observations and Addenda

1 - Ever since the Hydro began to supply power it has had to meet the competion of a private company, namely, The Ottawa Electric Company.

R I D E A U S Y S T E M

RIDEAU SYSTEM

Statement of Fact

A report of the stream flow in the Upper Rideau Canal was prepared for the H.E.P.C. in July, 1911. (1) The estimates were completed in 1910 (2) to supply Smiths Falls and surrounding district with light and power. After having made an exhaustive survey of the district and obtaining the necessary data respecting industrial conditions and present and future loads (3) and pending the construction of a development plant, a contract dated 25th January, 1918 (4) was entered into with the Rideau Power Company to purchase surplus power from the plant after the requirements of the town of Merrickville were satisfied by the Power Company. A minimum of 500 h.p. was to be purchased at the rate of $14.00 per h.p., contract to run for 20 years from date.

The first step towards placing the system in operation was made on the 5th September, 1918, when the line between Merrickville and Smiths Falls was made alive(5) At that time the peak load available from the Rideau Power Company was 450 h.p.

Construction of the High Falls plant was commenced in the Fall of 1918 on the Mississippi River, 22

A report of the steam plant in the Upper Ridean Canal was prepared for the K.J.P.C. in July, 1911. (1) The estimates were submitted in July (2) to supply Smiths Falls and surrounding district with light and power. After having work on preliminary issued at the commencement and completion the necessary data respecting industrial conditions and present and future loads (3) and pending the construction of a hydro-electric plant, (4) a provisional agreement was entered into with the Rideau Power Company to purchase surplus power from the plant after the requirements of the town of Merrickville were satisfied by the Power Company. A minimum of 800 h.p. was to be purchased at the rate of $14.00 per h.p., contract to run for 20 years from date.

The first step towards placing the system in operation was made on the 5th September, 1918, when the line between Merrickville and Smiths Falls was made alive. (5) At that time the peak load available from the Rideau Power Company was 450 h.p.

Construction of the High Falls plant was commenced in the Fall of 1918 on the Mississippi River, 22

miles north-west of Perth, at the head of Dalhousie Lake.

In the year 1919 the hydraulic plant and distribution system of H. Brown and Sons of Carleton Place was purchased; the municipality taking over the distribution system and the H.E.P.C. taking over the generating plant, for which they paid $60,000.[6]. A By-law to raise $100,000. was passed at the municipal elections for the purchase of the distribution plant and a farther By-law was passed by the electors approving of an agreement with the Commission for the supply of power.[7]

In May 1920, the High Falls development plant was completed with a capacity of approximately 3000 h.p. and the Carleton Place plant was shut down and is at present used as a "stand by" as the demands of the system can now be met by the High Falls plant alone.

Of the horse power generated by the High Falls plant (approximately 3,000 h.p.) the amount used in 1921 was as follows:-[8]

Carleton Place	769	h.p.
Smiths Falls	713	h.p.
Perth	522.7	h.p.
Lanark	388	h.p.

The total population covered by the Rideau System

miles north-west of Perth, at the head of Bulloneale Pass.

In the year 1913 the hydraulic plant and distribution system of H. Brown and Sons of Burleton Flour was purchased; the municipality taking over the distribution system and the H.E.P.C. taking over the generating plant, for which they paid $60,000. (6). A by-law to raise $100,000. was passed at the municipal elections for the purchase of the distribution plant and a further by-law was passed by the electors approving of an agreement with the Commission for the supply of power. (7)

In May 1920, the High Falls Development was completed with a capacity of approximately 3000 h.p. and the Burleton Flour plant was shut down and is at present used as a "stand by" as the demand of the system can now be met by the High Falls plant alone.

Of the horse power generated by the High Falls plant (approximately 3,000 h.p.) the amount used in 1921 was as follows:- (8)

Burleton Flour	721 h.p.
Mills Mills	712 h.p.
Perth	852.7 h.p.
Lanark	388 h.p.

The total population covered by the Hydro System

is as follows:-

Carleton Place	3786	
Kemptville	1179	
Lanark	583	
Perth	4047	
Smiths Falls	6665	16,260

The total capital investment represented by the System as of 31st October, 1921, was $1,074,004.45, of which $41,616.53 was expended during the year ending 31st October, 1921.

For the fiscal year ending 31st October, 1921, the sum of $30,000. was appropriated by the Legislature for the purposes of the System and an additional $12,416.07 by Treasury Board Minutes, making a total of $42,416.07, the whole of which was advanced by the Province to the Commission. Expenditures on the works of the System in the year amounted to $41,616.53, and on 31st October, 1921, there remained in the hands of the Commission $799.54, which amount is returnable to the Province of Ontario.

Reserves for Renewals to 31st October, 1920, were made by a renewal rate of approximately 3 1/7% per annum

is as follows:-

Carleton Place	5705	
Kemptville	1173	
Lanark	585	
[illegible]	[illegible]	
Smiths Falls	6835	16,295

The total capital investment represented by the system as of 31st October, 1921, was $1,095,[illegible].46, of which $41,616.03 was expended during the year ending 31st October, 1921.

The sum of $30,000. was appropriated by the provincial government for the purposes of the system and an additional $11,616.07 by [illegible] municipalities, leaving a balance of $19,616.07, the whole of which was advanced by the province to the commission. Expenditures on the works of the system in the year amounted to $41,616.03, and on 31st October, 1921, there remained in the hands of the Commission $700.34, which amount is returnable to the Province of Ontario.

Reserves for Renewals to 31st October, 1920.

[illegible] by a renewal rate of approximately [illegible] per annum

on a "straight line" basis. On the advice of its engineers the Commission, during the fiscal year ending 31st October, 1921, reduced this rate to approximately 3½%. The amount of this fund as of 31st October, 1921, was $38,365.47.

To 31st October, 1921, none of the municipalities had been taking power for a period of five years in the System and were relieved from paying sinking fund charges.

The Operating Account for the year ending 31st October, 1921, shows an excess of receipts over costs of $1,488.36, which amount represented over-payments for power by the four municipalities on the System.

The amount to the credit of the Reserves for Contingencies Account at 31st October, 1921, was $1,183.31.

It is estimated that the expenditures for 1922 would approximate $100,000. being $50,000. for Rural lines and $50,000. for betterments and extensions.

Notes

(1) H.E.P.C. Annual Report, 1911, page 214

(2) H.E.P.C. Annual Report, 1916, page 178

(3) H.E.P.C. Annual Report, 1917, page 175

(4) H.E.P.C. Annual Report, 1918, page 35

(5) H.E.P.C. Annual Report, 1918, page 145

(6) H.E.P.C. Annual Report, 1919, page 40

(7) H.E.P.C. Annual Report, 1919, Vol. 1, page 253

(8) H.E.P.C. Annual Report, 1921, page 78

(9) H.E.P.C. "Bulletin" December, 1921

(1) R.R.P.C. Annual Report, 1912, page 214

(2) R.R.P.C. Annual Report, 1916, page 1[illegible]

(3) R.R.P.C. Annual Report, 1917, page [illegible]

(4) R.R.P.C. Annual Report, 1918, page 30

(5) R.R.P.C. Annual Report, 1919, page 1[illegible]

(6) R.T.P.C. Annual Report, 1919, page 40

(7) R.R.P.C. Annual Report, 1919, Vol. 1, page 288

(8) R.R.P.C. Annual Report, 1921, page [illegible]

(9) R.R.P.C. "Railways" Handbook, 1921

Observations and Addenda

S T. L A W R E N C E S Y S T E M

ST. LAWRENCE SYSTEM

Statement of Fact

In 1912 the Hydro-Electric Power Commission entered into a contract with the Rapids Power Co. (M.F.Beach Power Co.) of Morrisburg, for 500 h.p. to supply power to the municipalities in that district.(1)

In the same year Brockville, Prescott and Winchester signed contracts with the H.E.P.C., and in 1913 Chesterville joined in.(2)

During 1912 and 1913 $53,000 odd was spent in the construction of low tension lines westerly up along the river from Morrisburg to Prescott, and also in a northerly direction as far as Winchester, Chesterville and Russell. Operation of the System first commenced in December,1913, power being supplied to Brockville, Prescott, Winchester and Chesterville.(4)

In April 1915 the power supply for the System was transferred from Morrisburg to Iroquois where the M.F. Beach Company's hydraulic plant was in operation.(5) In the same year arrangements were made to supply Williamsburg with power through a low tension line from Morrisburg, the power for this purpose being purchased from Morrisburg.(6)

During 1917 the total load demand of the municipalities during the year increased to 1,000 h.p., an amount considerably above the capacity of the generating station at Iroquois.

[illegible]

[illegible] Co.

In 1913 the Hydro-Electric Power Commission entered into a contract with the Rapids Power Co. (A.J.Nixon Power Co.) of Merrickville, for 800 h.p. to supply power to the municipalities in that district.[1]

In the same year Brockville, Prescott and Winchester signed contracts with the H.E.P.C., and in 1915 Cheesterville joined in.[2]

During 1913 and 1915 $93,000 odd was spent in the construction of low tension lines westerly up along the river from Merrickville to Prescott, and also in a northerly direction as far as Winchester, Cheesterville and Newboro. Operation of the System first commenced in December,1913, power being supplied to Brockville, Prescott, Winchester and Cheesterville.[3]

In April 1915 the power supply for the System was transferred from Merrickville to Ingersoll where the H.E.P. Co. Company's hydraulic plant was in operation.[4] In the meantime very arrangements were made to supply Williamsburg with water through a low lift from the Nation River, the power for this purpose being transmitted from Merrickville.[5]

During 1917 the total load demand of the municipalities served the year increased to 1,[illegible] h.p., an amount considerably above the capacity of the generating station at Ingersoll.

This difficulty was temporarily solved by paralleling the municipal auxiliary steam plant at Brockville with the Commission's power supply purchased at Iroquois.[7] During 1917 and 1918 plans were made for securing an adequate supply of power for the district, and during 1918 and 1919 the Commission constructed a 110,000-volt Transformer Station at Cornwall[8] and entered into a contract with the Cedar Rapids Power Co. for a supply of power sufficient to meet the needs of the future. After the first of May, 1919, power was received through this transformer station from the Cedar Rapids Co., which develops power at that point and exports into the State of New York.

As of 31st October, 1921, the following customers took power from the System in the following amounts;

Brockville	1,038.8 h.p.	
Chesterville	132.0	
Howard Smith Paper Co.	1,248.6	
Prescott	223.3	
Williamsburg	6.7	
Winchester	90.4	
Alexandria	158.0	
Apple Hill	14.7	
Cornwall Pulp & Paper Co	1,880.7	
Lancaster	22.7	
Martintown	10.8	
Maxville	32.0	4,857.2

Of these 12 customers the last six were added during the year ending 31st October, 1921. It is to be noted that the Howard Smith Paper Mills, Ltd., at Cornwall, purchases its supply of power from the System at a flat rate.

This difficulty was temporarily solved by permitting the Municipal Electric Light Plant to operate with the Commission's power supply purchased at Ingersoll.[7] During July and the Light Plant was unable to maintain an adequate supply of power for the district, and during this period the Commission entered into a 24,000-volt transmission system at Drumbo[8] and entered into a contract with the Cedar Rapids Power Co. for a supply of power sufficient to meet the needs of the future. After the first of May, 1919, power was received through this transformer station from the Cedar Rapids Co., which furnishes power at five points and serves less than half of New York.

As of 31st December, 1921, the following customers took power from the System in the following amounts:

Brownsville	1,010.0 kwh.
Cheapside	122.0
Howard Smith Paper Co.	1,264.6
Ingersoll	242.0
Mitchell	7.4
Windsor	90.4
Alexandria	124.0
Apple Hill	14.7
Brownell Ship & Paper Co.	1,242.7
Lancaster	21.7
Martintown	10.8
Maxville	4.54
	4,027.2

Of these 12 customers the last six were added during the year ending 31st October, 1921. It is to be noted that the Howard Smith Paper Mills, Ltd., at Cornwall, purchase its supply of power from the Light Co. at a rate only-

Investment in Works

The capital invested in the works of the System to 31st October, 1921, amounted to $854,193.58, made up as follows:

In Wood Pole Lines	$462,694.68
In Transformer Stations	378,369.52
In Rural Lines	13,129.38
	$854,193.58

The total population of the municipalities served, according to the H.E.P.C., is 15,860.

According to the estimates of the engineers of the Commission the sum of $276,000 will be required during the present year in order to complete works in course of construction, to make certain extensions and betterments and to construct certain rural lines.

Reserves for Renewals of Works

Up to the end of the fiscal year ending 31st October, 1920 reserves for renewals of works of the System had been set aside at a rate approximately 5% per annum on a straight line basis, and up to that date the sum of $70,320.40 had been set aside for that purpose. During the following year (ending 31st Oct.,1921) "on the advice of its engineers the Commission reduced the renewal charge to approximately 4½% on a straight line basis."(10) After revising the accounts of the Commission to make the latter rate effective as from the commencement of operation in

Investment in Value

The capital invested in the area of the Shire to 31st October, 1921, amounted to [illegible], making up as follows:

In Erf Owners Assets	[illegible]
In Transferred Freeholds	[illegible]
In Rural Lands	[illegible]
	[illegible]

The total population of the municipalities served according to the R.M.S.O., is 36,000.

According to the estimates of the engineers of the Commission the sum of £276,000 will be required during the present year in order to complete works in course of construction, to make certain extensions and betterments and to construct certain rural lines.

Reserve for Renewals at Value

Up to the end of the fiscal year ending 31st October, 1921 reserves for renewals at value of the Shire had not risen at a rate approximately equal to a straight line basis, and up to that date the sum of £70,820.40 had been set aside for that purpose. During the following year (ending 31st Oct.,1922) on the advice of its engineers the Commission reduced the annual charge to approximately equal on a straight line basis.[10]

After revalue the assets of the Commission is now [illegible] [illegible] the accumulated reserve is [illegible]

in 1914, and reducint the rates to the municipalities accordingly, the sum of $76,325.37 stood to the credit of this account as of 31st October, 1931.

Sinking Funds

Sinking Funds have been duly charged against the 6 municipalities in the System which have been operating for 5 years or more and also against those private companies receiving power under contract from the Commission in respect of works and equipment serving them. The total sinking fund thus collected to 31st October, 1931 amounted to $18,187.50.

Results of Operations

During the fiscal year ending 31st October, 1931 the revenue amounted to $131,906.14. The expenditure, including provision for renewals, contingencies and sinking fund amounted to $133,593.13. The costs thus exceeded the receipts by the sum of $1,686.99. It should be noted that there was a loss of $1,413.38 on the sale of power in the year to the Howard Smith Paper Mills, Ltd. This loss was distributed over and included in the cost of power to the municipalities

Between the 26th May and the 31st October, 1931 the System furnished on an average 1696 h.p. to the Cornwall Pulp & Paper Co.Ltd. After each power had been supplied and when $1,000 had been received in part pay-

in 1914, and reduced the rates to the municipalities accordingly, the sum of $76,389.87 accrue to the credit of this account as at 31st December, 1921.

Sinking Funds

Sinking funds have been duly arranged and the municipalities in the Cornwall district have been paying for 5 years or more and also against those private companies receiving power under contract from the Commission in respect of water and equipment serving them. The total sinking fund thus collected to 31st October, 1921 amounted to $16,197.60.

Income of Commission

During the fiscal year ending 31st October, 1921 the revenue amounted to $131,306.14. The expenditure, including provision for renewals, contingencies and sinking fund amounted to $128,393.13. The costs thus exceeded the receipts by the sum of $1,646.99. It should be noted that there was a loss of $1,412.30 on the sale of power in the year to the Howard Smith Paper Mills, Ltd. This loss was distributed over and included in the cost of power to the municipalities

Between the 26th May and the 31st October, 1921 the System furnished an average 1487 hrs. to the Cornwall Pulp & Paper Co.Ltd. After such power had been supplied and when $1,300 had been received in part pay-

ment, the Company became financially embarrassed, and according to Mr. Clarkson there would appear to be little if any prospect of the Commission realizing a balance due to it of $17,621.67. This loss has been charged against the cost of operation of the System, payable by the municipalities, and according to the auditor no credit as revenue was taken for the bills receivable amounting to $17,621.67.

Accumulated Deficit

Up to 31st October, 1920 the System had run up an accumulated deficit of $24,276.21. This deficit was been reduced on the books of the Commission by the adjustment of the renewals reserve above referred to, to $16,355.93, including interest charges and the deficit for the year. The accumulated deficit as of 31st October, 1921 amounted to $18,635.74.

ment; the Library issues Vimeolaily complaints, as "overdue" to-day, although there will always be a little of any budget of this character, amounting a money to $4 or $17,421.07. This loss has been charged against the net of quantities of the library, equally by the employees, and according to the auditor no credit is present on books for the total Commission, by $17,421.07.

Accumulated Deficit

Up to 31st October, 1920 the System had run up an accumulated deficit of $34,270.21. This deficit has been reduced on the books of the Commission by the adjustment of the transit relate data various to, as disposing including interest charges and the Library for the year. The accumulated deficit as at 31st January, 1921 amounts to $19,850.74.

ST. LAWRENCE RIVER

Notes

(1)

(2) Contracts confirmed 4 Geo.V, page 80

(3) H. E. P. C. Annual Report 1913, page 78

(4) H. E. P. C. Annual Report 1919, VIII

(5) H. E. P. C. Annual Report 1915, P. 111 and 126

(6) H. E. P. C. Annual Report 1916, page 135

(7) H. E. P. C. Annual Report 1917, page 105

(8) H. E. P. C. Annual Report 1919, page 90

(9) H. E. P. C. Annual Report 1921, page 73

(10) Auditors' Report, 1921, page 45

ST. LAWRENCE SYSTEM

Observations and Addenda

The H.E.P.C. Annual Report 1917, page 103, refers to the purchase of sub-station at Iroquois from New York & Ontario Power Co.

Note that the auditor refers to the loss of $17,621.87 during the year ending 31st October 1921, in respect of power supplied to the Cornwall Pulp & Paper Co.. Inquiry might be made as to why security in the form of a bond or otherwise was not taken in respect of this Company.

M U S K O K A S Y S T E M

MUSKOKA RIVER

Statement of Fact

As early as 1911 the Commission undertook a survey of power possibilities for the Muskoka district. Two sites were considered, one at High Falls and the other at South Falls on the south branch of the Muskoka River, about 7 miles from Gravenhurst and 25 miles from Huntsville.[1] In 1914 estimates were submitted to the Town of Huntsville covering delivery of power from the High Falls site and from the South Falls site[2] and in 1915 this municipality signed a contract to accept delivery of 800 h.p. After considerable investigation the Commission decided that the South Falls site was to be preferred. This site had been partially developed by the Town of Gravenhurst under a lease from the Provincial Government in the year 1909,[3] and it is estimated that this old plant was capable of developing 600 h.p.[4]

The new plant constructed by the Commission provides for a maximum installation of about 6,000 h.p. The old plant was taken over by the H.E.P.C. and construction work on the new enlarged plant began in September, 1915. The new plant was formally placed in commission on November 1st, 1916, power being supplied to Gravenhurst at 6600 volts and a small amount to Baxkoka Village at 120 volts. Later, in August of the same year,

MOUNTAIN STATION

HISTORY OF THE

As early as 1911 the Commission undertook a survey of power possibilities for the Okanagan District. Two sites were considered, one at High Falls and the other at South Falls on the south branch of the Okanagan River, about 7 miles from Greenhurst and 55 miles from Huntsville.[1] In 1914 estimates were submitted to the Town of Huntsville covering delivery of power from the High Falls site and from the South Falls site[2] and in 1915 this municipality signed a contract to accept delivery of 300 h.p. After considerable investigation the Commission decided that the South Falls site was to be preferred. This site had been partially developed by the Town of Greenhurst under a lease from the Provincial Government in the year 1909,[3] and it is estimated that this old plant was capable of developing 600 h.p.[4]

The new plant constructed by the Commission pre-

YEARS PAY A MODERN INSTALLATION AT COST 7,[illegible]

The old plant was taken over by the H.E.P.C. and construction work on the new enlarged plant began in September, 1915. The new plant was formally placed in commission on November 1st, 1916, power being supplied in Greenhurst at 2400 volts and a small amount in Huntsville at 110 volts. Later, in August of the same year,

the 25-mile line to Huntsville was placed in operation.[5] The contract between the Commission and the Town of Gravenhurst entered into 25th October, 1915, set out in full, H.L.P.C. 1916 Report, page 18. As of the year ending 31st October, 1921, Gravenhurst and Huntsville remained the only municipalities taking power from the System, the former taking an average load of 541.6 h.p. and the latter 872.6 h.p. It is to be noted that the Town of Bracebridge has not yet been added to the System.

Investment in Works

The capital investment in the works as of 31st October, 1921, was as follows:

In Power Development	$148,320.67
In Wood Pole Line	54,313.44
In Transformer Stations	9,896.85
	$212,530.96.

The population of Gravenhurst is 1,437, and of Huntsville 2,160, according to the reports of the Commission.

Reserve for Renewals

To Octo. 31st, 1920 a Reserve for Renewals was set up at a rate of approximately 5% per annum on a straight line basis.

"On the advice of its engineers the Commission reduced the rate to approximately 4% per annum on a straight line basis, revised the accounts accordingly so as to make the new rate effective from the commencement of operations in 1915 and correspondingly reduced the cost of power to the municipalities. On the amended basis

the 26-mile line to Huntsville was placed in operation.[b]

The rivalry between the Commission and the Town of Huntsville, mentioned into early volume, 1913, was at its zenith. H.E.P.C. 1916 Report, page 18. As of the year ending May 31st, 1913, Huntsville and Huntsville remained the only municipalities taking power from the system, the former having an average load of 441.4 kw. and the latter 272.4 kw. It is to be noted that the Town of Bracebridge had not yet been added to the system.

Increases in Sales

The capital investment in the years as of this date, 1921, was as follows:

In Power Development	$[illegible]
In Wood Pole Line	84,316.44
In Transformer Stations	[illegible]
	$[illegible]

The population of Gravenhurst is 1,427, and of Huntsville 4,110, averaging 4 to the rural population.

Reserve for Growth

To Octo. 31st, 1920 a Reserve for Growth was set up at a rate of approximately 4% per annum on a mileage line basis.

"On the advice of its engineers the Commission reduced the rate to approximately 4% per annum on a previous line basis, revised the accounts accordingly so as to make the new rate effective from the commencement of operations in 1914 and correspondingly reduced the amount of power to the municipalities. On the amended basis

the sum of $25,471.59 stands to the credit of this account."

Sinking Funds

Sinking Funds are being set up in the terms of the Act.

Result of Operations

The revenue for the year ending 31st October, 1921 was $26,471.53, $701.91 less than the total cost of power.

The result of the manipulation of the renewal rate converted an indebtedness of $6,178.13 as of Oct. 31st, 1920 into a credit of $1,914.35 as of 31st October, 1921.(5)

has was of $18,471.38 giving it the credit of this district.*

Giving Trade

Trading Funds are being set up in the towns of the

ACT.

Result of Operations

The revenue for the year ending June 30th, 1921, was $24,471.40, $701.21 less than the total cost of power.

The result of the manipulation of the renewal rate converted an indebtedness of $6,172.19 as of Oct. 31st, 1921 into a credit of $1,916.38 as of 31st October, 1921.

_ MUSKOKA _SYSTEM _

Notes

(1) H. E. P. C. Annual Report, 1911, page 287

(2) do. 1914, page 120

(3) do. 1915, page 250

(4) Estimate of A.V.White,
"Water Powers of Canada" 1911

(5) H. E. P. C. Annual Report, 1918, page 153

(6) Auditors' Report, 1921.

MUSKOKA AXETER

Observations and Addenda

E U G E N I A S Y S T E M

EUGENIA SYSTEM

Statement of Fact

The Development at Eugenia Falls was the second designed and constructed by the H.E.P.C., the first having been built at Wasdell Falls in 1914. The Georgian Bay Power Co.[1a] had a small plant at Eugenia Falls, their agreement with Artemesia Township being dated 15th June, 1905. This development had not proved successful, however, and after considerable negotiations it was finally taken over in 1913 by the H.E.P.C. for the sum of $60,000 cash.[1aa] The Order-in-Council authorizing the purchase and development of the waterpower was dated 6th November, 1913.[2a]

The initial installation of 4800 h.p. took place in 1915. The plant is situated on the Beaver River about 8 miles from Flesherton, in Grey County, and consists essentially of a storage dam on the Beaver River about one-half mile above the Falls, and from the reservoir thus formed a canal 5,000' long carries the water to a forebay, thence through a woodstave pipe and steel penstock to the power house. The operating head is 550 ft.[1]

The ultimate capacity of the development will be 12,800 h.p. The present turbine capacity is 8800 h.p. This plant is operated in parallel with the Severn and Wasdell Systems of the H.E.P.C. and the Swift Rapids plant owned and operated by the Orillia Water, Light & Power Comm.[2]

Prior to 1920 the Eugenia System supplied considerable surplus power to the Severn System, but this market has disappeared and the System ran at a loss during the year's operations ending 31st Oct., 1920.[3]

The municipalities included in the System as of 31st October, 1920, were: [4]

Arthur	Chatsworth	Chesley	Dundalk
Durham	Elmwood	Flesherton	Grand Valley
Hanover	Holstein	Horning's Mills	
Markdale	Mt. Forest	Neustadt	
Owen Sound	Shelbourne	Tara	Orangeville

Six more were added in 1921:

Kincardine	Lucknow	Priceville
Ripley	Teeswater	Wingham

The total population of these municipalities is 39,571. [5]

During the year ending 31st Oct., 1921 the amount of power generated was approximately 4,698 h.p. of which about 46 h.p. was sold to the Severn System.

The capital expenditures represented by the System as of 31st October, 1921, was $2,046,568.37, which is divided as follows:

In Power Development	$990,437.80
In Wood Pole Lines	815,629.70
In Distributing Stations	240,500.87
	$2,046,568.37

"For the fiscal year ending 31st Oct., 1920, $475,000 was appropriated by the Legislature for the purposes of the System, and of such appropriation moneys aggregating in amount $440,000 were paid over to the Commission for the purposes of the System. Of the sums so paid over, $250,942.00 was expended upon the System by the Commission. The balance remaining, $189,057.64, was disbursed by the Commission on other systems." [6]

The municipalities included in the system as of 31st October, 1956, were:[5]

Artist	Centreville	Fraser	Ursula
Burton	Elmwood	Tinkerton	Wood Valley
Hanover	Holstein	Worning's Mills	
Murdale	Mt. Forest	Teasdale	
Van Dyke	Vellafontaine	Zarr	

Six more were added in 1957:

Blairmeldy	Jackson	Valmont
Sylvic	Tannenbr	Vizgrave

The total population of these municipalities is 31,[illegible].[6]

During the year ending 31st Oct., 1957 the amount of power generated was approximately [illegible] mil. of which about 46 b.p. was sold to the Sovern System.

The capital expenditures recommended in the System as of 31st October, 1957, was $[illegible], which is divided as follows:

In power development	$[illegible]
In Wood Pole Lines	814,[illegible]
In Distributing Stations	[illegible]
	$[illegible]

For the fiscal year ending 31st Oct., 1958, $[illegible] was appropriated by the Legislature for the purpose of the system, and of such appropriation amount[illegible] in amount $[illegible] were paid over to the municipalities for the purpose of the System. Of the bond issue [illegible] $[illegible] was recovered over the System by the municipalities. The balance [illegible] interest on the municipal[illegible] bonds."[7]

For the fiscal year ending 31st Oct.,1921, the sum of $200,000 was appropriated by the Legislature for the purposes of the System, and of such appropriations sums aggregating $125,000 were requisitioned by and paid over to the Commission for the purposes of the System. The whole of such $125,000, together with $3,203.49 of Renewal and other reserve funds belonging to the System, were expended upon the System.

Costs of completion of works in course of construction, of betterments and extensions proposed to be made, and rural lines to be constructed, in the fiscal year ending 31st Oct., 1922, are estimated by the engineers of the Commission at $160,000.

In the opinion of the engineers of the Commission, the cost of -

Properties acquired for flooding areas	$112,220.00
Reinforced Concrete Dam	180,857.00
and Earth-fill Dam	32,111.00
a total of	$324,988.00

represent investments of such a character that reserves for renewals thereof are not necessary. On the balance of the moneys inbested in works, renewals are provided by an annual charge equivalent to approximately 4-1/4% per annum on a straight line basis. As of 31st October, 1921, the sum of $191,830.21 stood to the credit of the Reserve for Renewals account.

The Operating Account for 1910 showed the costs

exceeding receipts by the sum of $43,932.21. The revenue amounted to $125,943.21 and the cost of power, including provision for renewals and contingencies, amounted to $169,875.52.

During the year ending 31st Oct., 1920 all the municipalities on the System had been relieved from payment of sinking fund under provisions of Sec.23, some of them having been operating for a full period of 5 years. Last year, however, six of the 23 municipalities had been operating for more than 5 years and paid sinking fund charges amounting to $11,622.58.

Result of Operation

The accumulated deficit as shown in the Operating & Revenue Account of the System for the year ending 31st October, 1921, was $100,718.65. Of this amount $22,139.21 was added during the year ending 31st October, 1921, $43,932.21 during the preceding year and the balance during the earlier years of operation. There has been an annual deficit ever since operations began, Hanover being the only one of the 13 municipalities which has overpaid for power. On the other hand Owen Sound, which began to take power in December, 1915, has an accumulated deficit of $16,210.28, and Mount Forest which began operation at the same time has an accumulated deficit of $17,615.48.

Mr. Clarkson points out on page 52 of his report

exceeding receipts by the sum of $45,525.41. The revenue amounted to $156,945.51 and the cost of power, including provision for renewals and contingencies, amounted to $101,372.22.

During the year ending 31st Oct., 1920 all the municipalities on the System had been relieved from payment of sinking fund under provisions of Sec.24, some of them having been operating for a full period of 3 years. Last year, however, six of the 43 municipalities had been operating for more than 3 years and paid sinking fund charges amounting to $11,622.84.

Result of Operation

The surplus earned by reason of the operating a revenue account of the System for the year ending 31st October, 1921, was $100,718.68. Of this amount $32,158.21 was added during the year ending 31st October, 1921, $45,525.41 during the preceding year and the balance during the earlier years of operation. There has been an annual surplus over plant contribution since inception, except in the fiscal year ending 31st October, 1919, when the surplus for the year was $1,000.00 less than the amount required for power. In the fiscal year ending 31st October, 1921, the total surplus earned since inception amounted to $16,810.52, and Sinking Funds were being operating at the same time had an accumulated deficit of $17,813.04.

Mr. Sherman called attention to page 22 of the 1921 report

that the Act authorizes the Commission to extend the time for payment of sums payable by any municipality from time to time during the first three years after which it begins to take power; that of "twenty-three municipalities taking power from the Eugenia System, 7 had to 31st Oct., 1920 been operating for more than 3 years, had underpaid for power supplied to them up to that date and continued to do so for the fiscal year ending 31st Oct., 1921."

"During the year ending 31st October, 1921, the Severn and Eugenia Systems drew power from each other with the net result that the Severn system received on an average 46 h.p. more than was delivered to the Eugenia System, and paid for such power at the flat rate of $25.00 per horsepower. "In addition, the Severn System, for the benefit obtained of the tie lines, was required to pay its share of the maintenance expenses, interest charges and provision for renewals, contingencies and sinking fund in connection with such tie line, apportioned between the two systems on the basis of the aggregate power loads of each System.

A balance of $12,079.38 stands to the credit of Reserves for Contingencies account as of 31st October, 1921.

that the Act authorizes the Commission to extend the time for payment of some payable by any municipality from time to time during the first five years after which it begins to make payment that of twenty-three municipalities making payments into the Sugenis System, 7 has to date, 1930 been operating for more than 3 years, and undertook its power supplied to them up to that date and continued it as at for the fiscal year ending Sept. 30th, 1931."

"During the year ending Sept October, 1931, the water and Sugenis System drew power from each other with the net result that the Sugenis system received on an average 14 July, more than was delivered to the Sugenis System, and paid for such power at the flat rate of $22.50 per horsepower. In addition, the Water System, for the benefit attained of use via lines, was charged by its share of the maintenance expenses, interest charges and provision for renewals, replacements and sinking fund in accordance with such via lines. Apportioned between the two systems on the basis of the approximate power taken of each system.

A balance of $1,0[illegible] remains to the credit of Sugenis to reserve for Depreciation Account as of this January, 1931.

EUGENIA SYSTEM

Notes -

(1a) Georgian Bay Power Co., R.S.O. 1897, chapter 200

(1aa) H. E. P. C. file Y-605, Eugenia Falls - Georgian Bay Power Co.

(2a) See copy of Order-in-Council in Addenda hereto.

(1) H. E. P. C. "Bulletin" Nov. 1915, P.3

(2) H. E. P. C. Annual Report, 1918, page 140

(3) H. E. P. C. Annual Report, 1920, vi

(4) H. E. P. C. Annual Report 1921, P.72

(5) H. E. P. C. "Bulletin" 1921

(6) Auditors' Report for the year ending 31st October, 1920

N.B. -Where not otherwise noted material is based on Auditors' Report for year ending 31st October, 1921.

EUGENIA SYSTEM

Observations and Addenda -

1 - It is noted in connection with the Severn System that that System purchased 423 H.p. from the Wasdells System at a cost of $29.23 per H.P. per annum. This rate of $29.23, according to the Auditors' Report, represented the cost of generation and transmission.(Auditors' Report, 1921, page 43). Attention is drawn to the statement in Mr. Clarkson's report for the year ending 31st Oct., 1921, P.52, to the effect that "the Severn System received on an average 46 h.p. more than it delivered to the Eugenia System and paid for such power at the flat rate of 25.00 per horsepower."

2 - "Bulletin" March-April,1922, P.128

"The demands for power in general on the Wasdell, Eugenia and Severn Systems have now reached the capacity of the 3 developments which are all operated in parallel, and it has been necessary to make arrangements to purchase surplus power from the Town of Orillia at Swift Rapids. The Commission is giving present consideration to making arrangements to secure additional power for these Systems."

EUGENIA FALLS

Observations and Addenda

Following is copy of Order-in-Council, dated 5th November, 1913:-

Upon said consideration of the application of the Hydro Electric Power Commission of Ontario in that behalf, the Committee of Council advise that pursuant to the provisions of the Power Commission Act, Chapter 19, 7 Edward VII and amendments thereto, the Commission be authorized to develop the water power known as Eugenia Falls on the Beaver River in the Township of Artemesia, County of Grey and Province of Ontario, such authority to cover the following matters.

1. The purchase of the works assets real property and rights of the Georgian Bay Power Company at Eugenia Falls as above located.

2. The purchase of such additional riparian rights and privileges as may be found necessary in the opinion of the Commission for the complete ultimate development of the above mentioned site.

3. The purchase of necessary material and Equipment for construction of the plant at Eugenia Falls for the generation of electrical energy and for its transformation for transmission to the various Municipalities in the Owen Sound District.

4. The purchase of necessary material and Equipment for construction of transmission lines, and transformer stations for delivery of the said power to the various Municipalities in the Owen Sound District, including both low and high tension transmission lines.

Certified.

(Sgd) Lonsdale Caprool,

Clerk Executive Council

E U G E N I A S Y S T E M

Observations and Addenda

4. The System commenced operating in November, 1915. By October, 1916, 12 municipalities were connected.

The capital investment in the System including generating plant, transmission lines and distributing stations as of Oct. 31st, 1916, was $1,100,154.40 (1)

The capital investment as of Oct. 31st, 1921, to serve 23 municipalities, was $2,046,568.37

It is contended by the original 12 municipalities that the capital investment has been doubled and the service extended to 11 new municipalities without the H.E.P.C. consulting the original municipalities.

EUGENIA SYSTEM

Observations and Addenda

5. It is understood that in anticipation of a shortage of power in the immediate future, the engineers of the Commission have had under consideration three alternative schemes for increasing the amount of power available for the Eugenia System. One scheme is to put in a second pipe line at Eugenia. Another is to construct a generating plant at Severn Falls. The third alternative is to bring Niagara power into the System by building a line from Harriston to Mount Forest, a distance of about miles, and putting in a rotary transformer at the latter place. It is understood that this latter is the scheme most favored by the engineers.

EUGENIA SYSTEM

Observations and Addenda

The necessity of providing further power for the Eugenia and Severn Systems brings under immediate consideration the question of the status and functions of the 60 cycle systems in the northern part of the Province. In 1909 Mr. F. H. Sothman, the chief engineer, had represented "that this plant would only be used as a reserve at times in the day at which the load on the System exceeded the 4,000 h.p. capacity of the Big Chute plant."

The third report of the Hydro-Electric Power Commission, published in 1906, dealing with the water powers of the Province, recommended that Eugenia Falls and Big Chute should be developed and operated in parallel.

Under the present theory, though there is nothing definite in the statute or in the contracts with the municipalities to support the theory, the municipalities connected with the Eugenia plant are considered as constituting a unit system for the capital expenditures of which these municipalities are liable. Similarly the municipalities in the Wasdell System and other systems are in each case supposed to be liable for the capital outlay on the plants with which they are connected. Under this theory there are inevitable anomalies in the price paid for power by outlying places on the different systems, the price which each municipality pays for power being determined by the distance of the municipality from the generating plant. It rests of course with the arbitrary decision of the engineers of the H.E.P.C. whether for instance Mount Forest should be included in the Eugenia System or in the Niagara System. If the line from Harriston to Mount Forest is built as proposed, the question will at once arise whether Mount Forest should pay Niagara rates or Eugenia rates; and it will have to be decided whether the accident of Mount Forest being included originally in the Eugenia System shall permanently determine its liability to share in the payment of that System when in fact its power may be furnished by the Niagara System. It would seem that

EUGENIA SYSTEM

Observations and Addenda

the time was at hand when the question would have to be considered whether the present 60 cycle systems should not be considered in the light of peak load reducers for the Niagara System and whether the financial relation of the municipalities in these systems might not have to be revised.

It will also have to be considered, if the smaller systems are tied in with the Niagara System, whether and to what extent the municipalities on the smaller systems shall be deemed to become co-owners of the Niagara System, if and to the extent that the price of power to smaller municipalities includes an item of sinking fund it would seem necessary to concede an equity in the Niagara System.

The price paid for the comparatively small amount of power sold by the Eugenia System last year was $25.00 per horsepower, which was a flat rate. A similar rate had been charged in the Wasdell system for a larger amount of power and the question of the propriety of such a flat rate was raised by the auditor with the result that the rate was altered to $29.23 per horsepower, which rate was said to be "the cost of generation and transmission." It is obvious that serious questions remain for determination as to the proper basis of charges in such cases. Under the provisions of Sec. 23 (c)&(d) of the Act the matter is left wide open for determination by the Commission, but some consistent practice must be settled upon.

It is said that the reason the Eugenia was paid a flat rate and the Wasdell System a rate of cost of generation plus cost of transmission was because the Eugenia power was being sold through the Severn System to the Orillia Light, Heat & Power Co., and that inasmuch as Orillia was not a Hydro municipality, the Commission fixed a rate of $25.00 which allowed a slight profit; and that inasmuch as the power was Eugenia power the full amount of $25.00 was credited to the Eugenia System and the profit distributed among the various municipalities on the Eugenia System. On the other hand, the Wasdell power was used for the purposes of the Severn System at large and therefore a rate of $29.23 was fixed upon as being as nearly as possible the cost of generation plus cost of transmission.

6

E U C E N I A S Y S T E M

INTERIM RATE PER H.P. COLLECTED BY COMMISSION AND AVERAGE LOAD IN H.P. EACH YEAR, AFTER CORRECTION FOR POWER FACTOR, SINCE COMMENCEMENT OF OPERATION.

MUNICIPALITY	Date commenced	H. E. P. C. ESTIMATES: Rate per H.P.	H. E. P. C. ESTIMATES: Estimated Load in H.P.	No. H.P. held in reserve by Agreem't	Initial Load	1916 Rate	1916 Load	1917 Rate	1917 Load	x 1918 Rate	x 1918 Load	ø 1919 Rate	ø 1919 Load	ø 1920 Rate	ø 1920 Load	f 1921 Rate	f 1921 Load	1922 Rate
ARTHUR	1/12/16	45.		150	25	-	-	45.00	41	$45.00	102	$45.00	151.9	$65.00	129.0	$85.00	134.2	$85.00
CHATSWORTH	17/12/15	30.		75	8	$30.18	25.4	$30.18	15.2	30.00	31.1	30.00	29.4	45.00	29.0	60.00	28.5	70.00
CHESLEY	18/6/16	40.		400	87	40.00	80.4	40.00	90	40.00	95.5	40.00	159.8	45.00	250.3	55.00	241.6	55.00
DUNDALK	18/11/15	33.97		200	50.9	27.30	50.2	27.30	75.3	27.30	83	27.00	93.9	38.00	87.7	50.00	97.7	55.00
DURHAM	18/11/15			100	51.7	33.97	63.9	33.97	60.3	33.97	69.8	33.00	74.3	45.00	100.6	50.00	220.2	50.00
ELMWOOD	1/ 3/16				51.3	-	-	-	-	35.00	27.5	35.00	45.8	45.00	51.0	55.00	54.3	55.00
FLESHERTON	18/11/15	25.96		75	29.5	25.96	34.2	25.96	33.5	25.96	33.3	26.00	58.1	36.00	57.3	45.00	47.1	55.00
GRAND VALLEY	1/12/16	33.90		100	20	-	-	45.00	41.5	45.00	51.5	45.00	57.5	60.00	60.7	70.00	62.9	60.00
HANOVER	12/12/17			300	261.6	-	-	-	-	35.00	278.3	35.00	416.4	35.00	593.1	40.00	1040.7	35.00
HOLSTEIN	3/6/16	43.50		50	6.8	43.50	6.4	43.50	6.4	43.50	6.4	44.00	23.0	75.00	9.3	90.00	9.5	90.00
KINGARDINE	31/3/21	44.05		350	76.4	-	-	-	-	-	-	-	-	-	-	48.00	58.0	48.00
LUCKNOW	12/1/21	60.00		100	26.8	-	-	-	-	-	-	-	-	-	-	60.00	29.3	60.00
MARKDALE	18/11/16	23.00		150	67	23.24	60.0	23.24	73.0	23.24	67.0	23.00	74.0	35.00	85.7	50.00	85.2	50.00
MOUNT FOREST	18/11/15	24.31		400	186	34.51	98.5	34.51	106.2	34.51	119.1	40.00	129.3	55.00	151.6	65.00	185.6	65.00
NEUSTADT	12/12/18			100	8	-	-	-	-	42.50		42.50	18.5	45.00	84.2	55.00	126.3	55.00
ORANGEVILLE	3/6/16	35.00		200	60	35.00	128.7	35.00	94.5	35.00	127	35.00	134.3	55.00	136.2	65.00	142.1	65.00
OWEN SOUND	18/11/15			1200	899.5	31.00	992.0	31.00	978.5	31.00	1007.6	28.00	934.9	28.00	1132.2	30.00	1591.2	40.00
PRICEVILLE	17/3/21	31.00		25	5.0	-	-	-	-	-	-	-	-	-	-	47.00	4.1	47.00
RIPLEY	13/1/22	28.00		100	40.2	-	-	-	-	-	-	-	-	-	-	60.00	38.7	60.00
SHELBURNE	13/6/16	36.00		300	45.0	30.00	51.2	30.00	94.7	30.00	123.7	30.00	144.6	38.00	183.6	50.00	178.4	50.00
TARA	1/1/18			100	20	-	-	-	-	37.00	24.9	37.00	36.2	85.00	44.6	90.00	41.2	90.00
TEESWATER	19/12/20	40.00		150	30	-	-	-	-	-	-	-	-	40.00		40.00	60.4	40.00
WINGHAM	20/12/20	40.00		400	250	-	-	-	-	-	-	-	-	45.00		45.00	284.4	45.00

x - To April 30, 1919
ø - To Dec. 31, 1920
f - To Jan. 1st, 1922

$23.60,

5025 H.P.

that carried to Ellington

4483

23/135

$59.00 (about) average rate

5025
4481

SANDWICH, WINDSOR & AMHERSTBURG RAILWAY

The Sandwich & Windsor Passenger Railway Company was incorporated by an act of the Ontario Legislature on March 2nd, 1873, and empowered to construct a railway from the Town of Sandwich to the City of Windsor and continue the same to the Town of Walkerville. By an enabling act dated April 28,1887, the name of the Company was changed to the Sandwich, Windsor & Amherstburg Railway, and it was authorized and empowered to extend its railway from Sandwich to the Town of Amherstburg. The authority given to the Company to construct and operate a railway on the streets of the municipalities was conditional upon its obtaining the permissions of their municipal councils, and such permissions were obtained by agreements which have been renewed from time to time. On December 20th,1898, the Company purchased from the People's Electric Company of Windsor all of the property, assets, rights and franchises of that company, and on June 29th, 1904, it acquired all the rights, franchises and property of the City Railway Company of Windsor.

On October 17th, 1906, the Sandwich, Windsor & Amherstburg Railway Company purchased the whole of the share capital of the Windsor and Tecumseh Electric Railway Company, which had been incorporated by an Act of the Ontario Legislature of date December 22,1906, with authority to construct and operate an electric railway from some point in or near the City of Windsor through the Town of Walkerville and the Township of Sandwich East, to a point in or near the Village of Tecumseh. Under an agree-

ment dated December 3rd, 1907, the Windsor and Tecumseh Railway was released to the Sandwich, Windsor & Amherstburg Railway for a period of ninety-nine years.

The railway properties thus constructed and acquired, together with subsequent extensions thereof, form the present radial railway system of the company.

Areas of Operations

The Sandwich, Windsor & Amherstburg Railway owns and operates the following Electric Railway Lines:

(1) In the City of Windsor, through the Towns of Sandwich and Ojibway to the Town of Amherstburg.

(2) From the City of Windsor to the Town of Walkerville.

(3) Certain street railway lines in the City of Windsor and the Town of Walkerville

while the Windsor and Tecumseh Electric Railway Company owns

(4) A line of railway from the Town of Walkerville to the Village of Tecumseh, and

(5) Certain Railway lines in the Town of Walkerville.

all of which latter are operated by the Sandwich, Windsor & Amherstburg Railway which owns the rolling stock and conducts the operations in conjunction with its own properties.

Sandwich, Windsor & Amherstburg Railway.

Under Agreement dated January 14th, 1920, the H.E.P.C. purchased from Detroit United Railway, the plant, assets and capital stock of the Sandwich, Windsor and Amherstburg Railway including:

1.- All the outstanding shares of the Capital Stock of the Sandwich, Windsor & Amherstburg Ry., and the Windsor & Tecumseh Electric Ry., -fully paid-up-- and all shares and other securities in any subsidiary Companies belonging to either or both of them.

2.- All freehold and leasehold land of said Company.

3.- All plant, rolling stock.....and effects.....

4.- All franchises.....and rights.....

5.- All other property to which the said Companies were entitled in connection with their business.....excepting book accounts.

The purchase price was $2,659,000.00 paid in 40 year 4½% Bonds of the H.E.P.C., guaranteed by the Province of Ontario.

Under the terms of the purchase the H.E.P.C. did not assume bonds to the amount of $600,000.00 outstanding against the properties of the Sandwich, Windsor & Amherstburg Railway, and to the amount of $139,000.00 against the property of the Windsor & Tecumseh Electric Railway Company, but it was provided such obligations should be paid at their maturity by the Detroit United Railway, as security for which payment, $739,000.00 par value of the bonds, (being part of the $2,000,000.00 said given in purchase), were delivered to National Trust Co., Ltd., to be held in escrow and handed over to the Detroit United Railway Co., upon the retirement of each $700,000.00 outstanding issues of the Company.

To provide the purchase price $2,100,000.00 of the bonds as described were issued, $1,250,000.00 being handed over to the D.U.R., $739,000.00 to National Trust Co. while the balance of $61,000.00 which remains in hands of the Commission have since been hypothecated with the Bank of Ottawa as security for advances obtained to provide for improvements and extensions.

; required by Sec. 11 of the Hydro-Electric Railway Act, the Municipal-
who entered into the agreement with the H.E.P.C., for the acquisition
ration of the Railway which included Sandwich East, Sandwich West,
r, Ford City, Walkerville, Sandwich, Amherstburg, Ojibway have deposi-
unicipal Debentures as respectively apportioned to them aggregating
3,444.00.

e Township of Anderdon defeated the By-Law. Accordingly the above men-
l Municipalities as required by the Provisions of Sub-section 1 of Sec.
f the Hydro Electric Railway Act deposited additional debentures to the
t of $143,556.00 to provide the guarantee originally apportioned to the
ship ofAnderdon.

e total of Municipal Debentures authorized, issued and deposited by
unicipalities with the Commission thus totals $2,100,000.00 being the
t of H.E.P.C Debentures guaranteed by the Province, issued to purchase
ilway.

the operations of the Railways the entities of the respective Corpora-
have been maintained by a Board of Directors elected with the approval
H.E.P.C., all of whom are members or employees of the H.E.P.C. On Oct-
31st 1920 the Board of Directors of the Sandwich Windsor & Amherstburg
consisted of

Sir Adam Beck	President
Hon. I.B.Lucas	Vice-President.
Hon.D.Carmichael	Director
Mr.W.W.Pope	Director & Secretary
Mr. F.A.Gaby	Director
Mr.J.W.Gilmour	Director & Treasurer
Mr. W.G.Pierdon	Director
Mr.H.A.Hugill	Director & Asst. Secretary.

while the Directors and Officers of the Windsor &
ch Electric Railway Co. were:

Sir Adam Beck	President.
Hon. I.B. Lucas	Vice-President.
Hon.D.Carmichael	Director.
Mr.W.W.Pope	Director & Secretary
Mr. F.A.Gaby	Director.
Mr.J.W.Gilmour	Director & Treasurer.
Mr. W.G.Pierdon	Director.
Mr. H.A.Hugill	Director & Asst. Secretary.

remuneration is paid to the Directors or the Companies for their ser-
as such but charged in the operating expenses of the Railway Companies
proportionate amount of the administrative expenses of the Commission.
whole tenor of the Hydro Electric Railway Act is to the effect that
ire Electric Power Commission of Ontario shall possess direct title to
nership of all railways acquired and operated by it under the terms of
t, and no provisions are included in the act which permit of the acquisi-
r purchase by the Commission of shares of a Railway Company. In the pur-
of the Sandwich Windsor & Amherstburg Railway and of the Windsor & Tecum-
ectric Railway Company, the Commission did acquire direct title to all
ets of such Railway Companies but at the same time as provided by the
ost of purchase approved by the Legislature, it also acquired the whole
shares of the Capital Stock of such companies. With control of such
the Commission ignored to operate the railways, thus the action of the
ies which was done, a course not contemplated by the Hydro Electric
y Act, but one which the Commission has been compelled to follow by
of the fact that bonds to the amount of $789,000.00 issued by such
y Companies are still outstanding and unpaid. So far as can be seen no
culties have yet arisen from the course adopted but there is no certainty
complications may not arise if a course not contemplated by the Hydro-
ric Railway Act is to be followed, when such Act forms the basis of the
rity granted to the Commission, whereby it is empowered to operate elec-
railways; accordingly it would appear to be advisable that just and as
as the $789,000. of Bonds of the Railway Companies outstanding be liqui-
and paid, the Sandwich, Windsor & Amherstburg Railway and the Windsor
Tecumseh Electric Railway Company cease to operate as separate entities
ted by Boards of Directors and that direct control be assumed by the
sion over the properties and assets without the intervention of such
nies.

e Report for the period ending 31st October 1920 shows a net operating us of $22,078.29, but Mr. Clarkson points out that no provision has made in the above costs of operation in respect of sinking fund instal- to repay the cost of the Road, Sub-section 2 of Section 6 of the Act ding that it shall not be necessary for the Commission to raise or pro- any Sinking Funds until after the expiration of a period of ten years the inception of operations within its control.

PORT CREDIT TO ST. CATHARINES RAILWAY

The Port Credit to St. Catharines Railway is projected to run from the Village of Port Credit, in the Township of Toronto westward through Oakville, Burlington, Hamilton, Grimsby and St. Catharines.

Costs of construction and equipment of the Port Credit to St. Catharine Railway were estimated by Engineers of the Commission at $11,500,365, and with the approval of by-laws submitted in respect thereto, 16 municipalities entered into agreement in the year 1913 for the construction and operation of the proposed railway under the terms of the Hydro-Electric Railway Act. This agreement was approved by Order in Council dated 18th September, 1916. By further Order in Council dated 8th August, 1919, the Treasurer of Ontario was authorized to guarantee bonds of the Commission to the extent of $11,500,365 for the purposes of providing funds for the construction and equipment of the road. Bonds of the Commission bearing date November 1st, 1919, with interest at 6%, and payable on Nov. 1st,1969 were prepared and guaranteed by the Province of Ontario to the extent of $11,500,365, and of such bonds $1,500,000 have been executed by the Commission and deposited with the Bank of Montreal as collateral security for certain loans hereinafter mentioned. The balance of the bonds amounting to $10,160,365 had not been issued but remained on October 31st,1930 in the possession of the Commission signed by the Chairman but not executed by the Secretary of the Commission, while the seal of the Commission was not attached to them.

Under Section 11, sub-section 1, of the Hydro-Electric

Railway Act, it is provided that with execution of an agreement for the construction of a hydro-electric railway the corporations signatory thereto shall deposit with the Commission debentures to the amounts apportioned as their respective shares of the cost of the construction and equipment of the proposed railway, and under the provisions of such section there has been lodged with the Commission, by the municipalities interested, debentures to the amount of $11,300,150.05. These debentures bear date of November 1st, 1919 and are payable in 24 years with interest at 5% per annum.

To October 31st, 1920 the amount expended by the Commission on the undertaking totalled $412,[illegible].15.

To provide the funds out of which said expenditures were made, the Commission to Oct. 31,1920 had borrowed the sum of $100,000. from the Bank of Montreal, while the remaining $312,[illegible].15 was obtained was obtained with the use of appropriations and funds held by the Commission for the benefit of Hydro-Electric power systems. Since Oct. 31st, 1920, and on December 15th,1920, the Commission borrowed a further $460,000. from the Bank of Montreal upon the security of the $1,200,000 of bonds before mentioned, thus repaying the Hydro-Electric Power Systems the money withdrawn out of the appropriations held for their benefit, and leaving in the hands of the Commission for the purpose of the Port Credit to St. Catharines Railway the sum of $60,379.15.

Subsequent changes since 1920.
See Commission Report
First Session of Legislature

[illegible] TO PORT CREDIT RAILWAY

The Toronto to Port Credit Railway is projected to run from the City of Toronto westward through the Town of Mimico, the Townships of Toronto, Etobicoke and New Toronto, to connect at the Village of Port Credit with the Port Credit to St. Catharines Railway. The costs of constructing and equipping the Railway was estimated by engineers of the Hydro-Electric Power Commission at $5,103,273, and under agreements entered into in 1913 the following municipalities had to October 31, 1920 deposited debentures of their own issue with the Commission to the extents set opposite their respective names, viz:

Township of Toronto	$ 120,042.00
" Etobicoke	481,[illegible].00
" New Toronto	81,150.00
Village of Port Credit	54,020.00
Toronto City	4,240,136.00
Town of Mimico	111,200.00
Total of	$ 5,103,273.00

Such debentures bear date July 1st, 1913, and are payable in 30 years with interest at 5% per annum.

To October 31st, 1920, no bonds had been issued by the Hydro-Electric Power Commission of Ontario in respect of the costs of construction and equipment of the Toronto and Port Credit Railway, but expenditures to the amount of $[illegible].74 had been made in connection therewith by the Commission, under the following circumstances.

The Commission states that in the latter part of the fiscal year ending October 31, 1919, it received assurances from Sir William Hearst, the then Premier of Ontario, that if it would obtain resolutions from the municipalities interested requesting

the Government to intervene and pass all enactments to validate existing legislation that might be necessary to validate the building of an electric railway line between Toronto and St. Catharines as a part of the proposed Toronto to St. Catharines Hydro- Electric Railway--so as to make the same legal, valid and binding upon the municipalities--that the Government would with the presentation to it of such resolutions support legislation to that effect. On the basis of these assurances and with the resolutions by the municipalities in its possession, the Commission states that it felt justified in acquiring rights-of-way and later making further expenditures thereon out of funds held by it under the terms of the Power Commission Act in the belief that by so doing it would make a saving in the cost of the proposed Port Credit to Toronto Railway line. To October 31st, 1919, the amounts so expended by the Commission upon the undertaking were as follows:

(a)	Expended upon the purchase of rights-of-way	$314,795.[illegible]
(b)	Expenditures upon surveying, engineering administrative expenses and interest	[illegible]
		$423,[illegible].74

of which $90,331.57 was expended in the fiscal year ending October 31, 1919, while the sum of $327,975.17 was distributed in the fiscal year ending October 31st, 1920.

The money expended as above set out was obtained with the use of appropriations and funds held by the Commission for the benefit and purposes of Hydro-Electric Power System.

TORONTO AND EASTERN RAILWAY

The Toronto and Eastern Railway is projected to run eastward from the City of Toronto towards the Town of Beaverville. The corporations of the municipalities and townships through which it is projected to run have passed the by-laws required to be approved under the provisions of the Hydro-Electric Railway Act, and certain of them, but not all of them, have executed agreements in respect of the construction and operation of the proposed line by the Commission. No debentures have been deposited by any of the municipalities or corporations interested with the Commission, neither has the Commission issued any bonds for the purposes of construction and operation of the proposed railroad. To October 31st,1920, the sum of $42,944.49 had been expended upon the proposed undertaking, $7,949.42 thereof having been expended in the fiscal year ending Oct. 31, 1919, while the balance of $36,995.07 was disbursed in the fiscal year ending October 31, 1920.

In both of the fiscal years ending Oct. 31,1919 and Oct. 31, 1920, moneys expended by the Commission upon the Toronto and Eastern Railway were provided out of appropriations and funds held by it for the benefit of Hydro-Electric Power System.

Officers of the Commission state that instead of asking for an appropriation by the Legislature out of which to make such expenditures at the cost of the Province, the moneys mentioned were disbursed out of funds in the hands of the Commission and capitalized upon its books in the expectation that construction of the railway would be proceeded with then, with the sale of securities for such purposes, the moneys disbursed would have been repayment to the Commission as part of the costs

of construction of such railway.

The explanation contained in the preceding paragraph relative to the appropriation of funds for the purpose of the Toronto & Eastern Railway is that of Mr. Clarkson, who makes the same explanation in connection with

> Hamilton, Galt, Elmira & Guelph Railway,
> Hamilton, Brantford, Tomistown & London Ry.,
> St. Catharines & Niagara Falls Railway,
> Niagara, St. Catharines & Toronto Railway,
> Toronto Suburban Railway,

hereinafter referred to.

HAMILTON, GALT, ELMIRA & GUELPH RAILWAY

The Hamilton, Galt, Elmira & Guelph Railway is projected to run from the City of Hamilton through intervening townships and municipalities and to connect with the City of Galt, the Town of Elmira and the City of Guelph. By-laws relative to the construction and operation of such railway were carried by certain but not all of the municipalities interested and no agreements appear to have been executed between any of the municipalities interested and the Commission. No bonds have been issued by the Commission for the purposes of construction and equipment of the road. To October 31,1918, the sum of $38,[illegible].00 had been expended by the Commission in respect of the projected railway, and of this amount $10,[illegible].10 stood invested on Oct. 31, 1919, while $28,137.10 was disbursed in the fiscal year ending Oct. 31, 1920. Moneys to meet all expenditures as made by the Commission in both of such fiscal years were provided out of funds held by it for the benefit of Hydro-Electric Power Systems.

HAMILTON, BRANTFORD, TEMBROKE & LONDON RAILWAY

The Hamilton, Brantford, Pembroke and London Railway is projected to connect the City of Hamilton with the Cities of Brantford, Pembroke and London. By-laws with respect to the construction, equipment and operation of such railroad had to October 31st, 1910, not been submitted, neither had any agreements ~~[illegible]~~ been executed between the Commission and the municipalities interested. No bonds had been issued by the Commission for the purposes of construction equipment and operation of the projected railroad. To October 31st,1910, the sum of $17,974.34 had been expended upon the undertaking, the whole amount of such expenditures having been disbursed in the fiscal year ending on that date, moneys to meet the expenditure so made were provided out of funds and appropriations ~~xx~~ paid to and held by the Commission for the use of Hydro-Electric Power System.

ST. CATHARINES & NIAGARA FALLS RAILWAY

In the fiscal years ending October 31st, 1919, and 1920, the Commission expended the sum of $11,831.02 and $12,933.27 respectively, or a total of $25,764.29 for preliminary engineering and for surveys of a proposed railroad designated as the "St. Catharines and Niagara Falls Railway." On October 31st, 1920, no by-laws had been passed by the municipalities through which it was proposed that such railway should be projected, neither had any agreements been entered into between such municipalities and the Commission. No bonds have been issued by the Commission in respect of the costs of construction and operation of the road.

The $13,933.27 expended for the fiscal year ending October 31st, 1920, was provided by the use of appropriations and funds paid to and held by the Commission for the benefit of Hydro-Electric Power System.

NIAGARA, ST. CATHARINES AND TORONTO RAILWAY
TORONTO SUBURBAN RAILWAY

During the fiscal year ending October 31st, 1919, certain negotiations obtained between the Hydro-Electric Power Commission of Ontario and the Dominion Government with respect to purchase by the Commission of the Niagara, St. Catharines & Toronto Railway and the Toronto Suburban Railway owned by the Canadian National Railways. In connection with such negotiations the Commission had valuations of the properties made at costs of $1,005.27 in connection with the Niagara, St. Catharines & Toronto Railway, and $5,604.86 in connection with the Toronto Suburban Railway. The moneys necessary to meet such costs were provided from the use of funds held by and appropriations paid to the Commission for the benefit and purposes of Hydro-Electric Power Systems.

It may be in order for the Commission to consider in a tentative way on the basis of the above sketch:-

1. Whether the circumstances constituted in each case a sufficient justification for the particular project.

2. Whether the project was duly authorized by Legislation.

3. Whether the relationship of the Hydro-Electric Power Commission to the project is proper and satisfactory or what, if any alterations is desirable.

4. Whether the relation of the municipalities to the project is proper and satisfactory or whether any alteration is desirable.

5. Whether the relation of the Province to the project is proper and satisfactory or whether any alteration is desirable.

Attention is also drawn to the following questions arising on the above material:-

Who will own the following when they are paid for:

(a) The Niagara Transmission System,
(b) The Chippawa Plant,
(c) The Ontario Power Company,
(d) The Thorold System,
(e) The Essex System,
(f) The Sandwich, Windsor & Amherstburg Railway.

QUESTIONS FOR CONSIDERATION

It may be in order for the Commission to consider in a tentative way on the basis of the above sketch:-

1. Whether in the following cases the circumstances, Commercial Economic, Physical, etc., constitute a sufficient justification for the particular project.

   (a) Purchase of Ontario Power Company.

   (b) Construction of Third pipe line.

   (c) Acquisition of Essex System.

   (d) Acquisition of Central Ontario System.

   (e) Construction of Bonne Chere Water Storage System.

   (f) Undertaking of Nipigon Development.

   (g) Undertaking of Wasdell Development.

   (h) Undertaking of Rideau System.

   (i) Undertaking of St.Lawrence System.

   (j) Initiation of various railway schemes.

2. Whether in any of the above instances the Commission went further than the Legislature intended.

3. Whether in any of the above cases the Hydro-Electric Power Commission went further than the Municipalities would have sanctioned.

4. Whether in the above instances the relationship of the Hydro-Electric Power Commission to the project is proper and satisfactory and what, if any, alterations are desirable.

Executive Office - 317 Power Building, Montreal Head Office -- Port William, Ont.

Directors -- Sir H.M. Pelt, President, Montreal; J.H. Roamer, Vice President, Montreal, S.A. Black, Montreal; J.F. Aldred, Sault Ste Marie; F.H. Phippen, K.C. Toronto; J.S. Morris, Montreal; W.L. Bird Port William, Ont; K.H. Patterson, Port William, Ont.

Secretary -- W.L. Bird, Port William, Ont. Asst. Secy. & Treasurer-J.L.Morris, Montreal.

Managing Director -- S.A. Black, Montreal.

DEC. 31st, 1920. CAPITAL AUTHORIZED $2,500,000 SUBSCRIBED $2,200,000 PAID UP $2,200,000

SHARES $100 each.

BONDS: AUTHORIZED $2,000,000; OUTSTANDING $1,921,000. FIRST MORTGAGE, thirty-year, 6 per cent -$500 and $1,000 each. -gold

BONDS: Dated 2nd January, 1907. Due 1st January 1937. Interest payable 1st January and July. Secured by mortgage on all the real and personal property, rights and franchises whether now owned or hereafter acquired.

SINKING FUND: Beginning with 1st January, 1917, and on each succeeding 1st of January, 1% of the outstanding bonds will be redeemed and cancelled either by drawing or purchase in the open market at a price not to exceed 100.

LIABILITIES

Capital Stock	$2,500,000.00	
Less Unissued	300,000.00	$2,200,000.00
First Mortgage Bonds		1,921,000.00
Accrued Interest on Bonds		32,016.72
Wages, unpaid and unclaimed		6,141.65
Accounts payable		4,417.51
Dividends payable Nov. 15th		43,998.00
Suspense Account		120,141.36
Rest Account		135,000.00
Depreciation and General Reserve		249,000.00
Surplus		502,318.59
		$5,324,033.83

ASSETS

Property, Plant, Franchises, etc.	$4,633,072.99
Treasury Bonds	120,123.82
Investment Securities	282,727.50
Accounts receivable	85,702.34
Unexpended Balances	6,500.45
Cash	196,211.73
	$5,324,033.83

PROFIT AND LOSS ACCOUNT

Operation and Maintenance	$112,878.12		Gross Revenue	$449,273.18
Depreciation and Renewal Reserve	* 34,000.00			
		$146,878.12		
(*In addition to $6,000.00 appropriated on monthly basis during the year)				
Fixed Charges		96,062.62		
Net Revenue .....$302,695.06....	$			
Net Income 206,632.44				
Dividends Paid	131,994.00			
Dividend payable November 15,1920	43,996.00			
		175,992.00		
Transferred to Surplus account		20,640.44		
		$ 449,273.18		$ 449,273.18

ANNUAL MEETING, any judicial day in January

TRUSTEE -- The Royal Trust Company, Montreal.

DIVIDEND - 8 per cent. per annum, quarterly 15th February, May August and November. Increased from 6% to 7% for quarter beginning May 1st, 1916. Increased to 8% for quarter beginning November 1st, 1917. Stock bonus of 13⅓% was paid in Dec. 1919.

TRANSFER OFFICE-- 217 Power Building, Montreal, Que. AUDITOR -- H.R. Lyons, Montreal.

REVENUE

While gross revenue was well maintained throughout the year, net revenue was restricted by high costs of labour, supplies and taxation; these costs were further aggravated by the necessity of carrying out maintenance work deferred during the war for want of men. With the present declining costs of materials and supplies some reduction in expenses is expected in next year's operations.

DIVIDENDS

There has been distributed to shareholders during the year $171,992.00 dividends, representing 6% on the paid-up Capital Stock of the Company.

FINANCIAL

During the year there were redeemed for sinking fund purposes $20,000.00 of mortgage debt.

The Company has ample cash resources for its present needs, which, pending permanent employment is well invested.

PROPERTIES AND PLANT

The properties and plant of the Company have been well maintained throughout the year in a high state of efficiency, and the usual provision has been made for depreciation.

GENERAL

As indicated in last year's Report, the power supplied by your Company to the City of Port Arthur, through the Hydro-Electric Power Commission of Ontario, will, it is expected, be discontinued on December 31st, 1920, by limitation of contract; the involved power, together with all other available power, has been diverted on more favorable terms to the Port William Paper Company, Limited, under a long term contract.

M O N T A N A

STOCK

	1917		1918		1919		1920			1921		
	High	Low	High	Low	High	Low	High	Low	Sales	High	Low	Sales
January	...	...	...	...	...	...	...	..	...	93	87	104-3/10
February	...	...	...	...	...	...	.95	83½	170	92¼	90-1/8	60-3/8
March	...	...	...	...	...	...	90	83½	330	90	88	36
April	...	...	...	...	...	...	...	..	...	92	91	27
May	...	...	...	...	...	...	89	88	30	..	..	...
June	...	...	...	...	...	...	90	86	230	88	86	20
July	...	...	...	...	...	...	92½	92½	40	85	85	24
August	...	...	...	...	...	...	97	92½	70			
September	...	...	120	120	...	...	92½	92½	25			
October	...	...	...	...	...	...	92	92	5			
November	...	...	...	...	...	...	...	...	...			
December	...	...	...	...	...	...	92	92	639			
SALES			8					1,589				
DIVIDENDS	7		8		8			8 x 13½				
(d) Net yr October 31st			10.18		19.16			9.19				

BONDS 5%

	1917		1918		1919		1920			1921		
	High	Low	High	Low	High	Low	High	Low	Sales	High	Low	Sales
January	....	...	...	...	...	...	...	...	...	...	...	...
February	...	...	...	...	...	...	...	...	...	...	...	...
March	...	...	...	...	...	...	...	...	...	...	...	...
April	...	...	...	...	...	...	...	...	...	...	...	...
May	...	...	...	...	...	...	...	...	...	81	80	2,000
June	...	...	...	...	...	...	...	...	...	...	...	...
July	...	...	...	...	...	...	...	...	...	...	...	...
August	...	...	...	...	...	...	...	...	...	...	...	...
September	...	...	...	...	...	...	...	...	...	...	...	...
October	...	...	85	85	...	...	...	...	...	...	...	...
November	...	...	...	...	...	...	...	...	...	...	...	...
December	...	...	...	...	...	...	...	...	...	...	...	...
SALES	...		$1,000		...	...	...	...	...	...	...	...

| | | |

CONTINUED.

$ -- After "Depreciation"

CAPITAL STOCK -- Issued previous to 1914 -- $ 2,000,000
Allotted February 26th, 1914 200,000 at 100
Allotted December 17th, 1920 297,000 at 100 18½% stock bonus.

L O N N O N .

	STOCK					BONDS				
	1916	1917	1918	1919	1920	1916	1917	1918	1919	1920
High	30	130	124	110½	115	97	96½	90¼	101	94¼
Low	12½	120	110	94½	94½	91¼	89½	84	86¼	80¼

T O P I C A L S K E T C H

The following will serve -

(a) As a Topical Sketch of the subjects to be considered by the Commission;

(b) As a skeleton upon which the report of the Commission might be based;

(c) As an index for the filing of data.

The sketch is susceptible of variation according to the purpose for which it is to be used.

It is also susceptible of expansion according as further topics may be taken under consideration.

The primary division is into

A. General

B. Engineering

C. Accounting

Topics which may be taken up under the head of "Engineering" or "Accounting" may be deleted from the "General" head

The findings or recommendations of the Commission might be set down under each topic or reserved for a separate section.

A GENERAL

1 HISTORY

(a) Stage of Development of Electric Power Transmission in Ontario in 1902.

(b) Circumstances giving rise to original scheme of Hydro-Electric System.

(c) Franchises of Private Companies at Niagara Falls.

(d) International Treaties controlling Water Supply:
Burton Act,
International Waterways Commission.

(e) Initiation of Hydro-Electric Scheme

(f) Early Estimates of Demands for Power

(g) Early Engineering Reports

(h) Political History

(i) History of Early Legislation

(j) Hydro-Electric Power Commission Act, 1905
General Scheme of Act.

(k) Appointment of Permanent Commission:

(l) History of Construction of Niagara Transmission System:
Original Plan,
Changes,
Extensions.

(m) Administration during Construction Period.

(n) Relations with Generating Companies.

(o) Effect of Hydro-Electric System on Vested and other Private Interests:
Expropriation,
Private Systems,
Contests with Adverse Interests.

(p) Growth and Development of Niagara System

(q) Acquisition of Ontario Power Company -

Circumstances leading to acquisition.
Acquisition of Undertakings.
Method and terms of acquisition.
Authority for acquisition.
Ownership of Property.
Responsibility for indebtedness.
Prospects of liquidation.
Relation to Chippewa Development.

Construction of Third Pipe Line:-
Circumstances leading to construction.
Authority for construction.
Performance of work.
Appropriation for payment.
Amortization of cost.
Effect on cost of power.
Justification for undertaking.

(qq) The Chippewa-Queenston Development -

Earlier Discussion of Project.

Circumstances leading to undertaking.

History of undertaking:
Changes in stage of undertaking
Estimates.

Acquisition of Undertakings:
In original scheme.
In enlargements of scheme.

Relation of Government to undertaking.

Authority for undertaking.

Authority for extension

Justification.

State of Completion.

Present output

Present demands

Estimate of future demands.

Estimate of future capacity.

Probable total cost:-

(a) for installation of three units
(b) " " " five "
(c) " " " nine "

Scheme of amortization.

Probable cost of power.

(f) Thorold System -

Description.

History of acquisition.

Relation of H. E. P. C. to System.

Relation of municipalities to System.

Disposition of Profits

Provision for sinking funds.

(g) Essex System -

Description.

History of acquisition.

Relation of H.E.P.C. to System.

Relation of municipalities to System

Relation to Niagara System.

Burden of losses.

Provision for sinking funds.

(t) Central Ontario System:

Description,

History of Acquisition,

Relation of H. E. P. C. to System ,

Relation of Municipalities to System,

Analysis of different Undertakings and results to date,

Responsibility for Success of System,

Responsibility for Indebtedness,

Future Disposition of System,

Provision for Sinking Funds.

(u) Bonne Chere River Storage System (Renfrew System):

Description of System ,

History of Construction,

Relation of H. E. P. C. to System,

Relation of Municipalities to System,

Responsibility for System,

Provision for Sinking Funds,

Provision for Losses,

Future disposition of System.

(v) Thunder Bay System:

Description of System,

History of System,

Appropriations for Construction,

Responsibility for Nipigon Development,

Relations of Pt. Arthur and Pt. William to System,

Equality of Rates as between Pt. Arthur and Pt. William,

Administration of local Distribution System,

Provisions for Sinking Funds,

Amortization of Cost,

Responsibility of Municipalities for Cost,

Responsibility of Government for Cost.

(w) Severn System:

Description of System,

History of System,

Relation to Wasdell System and Eugenia System,

Ownership of System.

(x) Wasdell System:

Description,

History,

Provision for Sinking Fund,

Responsibility for Construction,

Disposition of Losses,

Relation to Severn System.

(y) Ottawa System:

Description,

History,

Relation of H. E. P. C. to System.

(z) Rideau System:

Description,

History,

Relation of H. E. P. C. to System.

(aa) Muskoka System:

Description,

History,

Relation of H. E. P. C. to System.

(bb) Eugenia System:

Description,

History,

Relation to Severn System.

(cc) Sandwich, Windsor & Amherstburg Railway, including Windsor & Tecumseh El. Rly. Co.

(dd) Port Credit - St. Catharines Railway.

(ee) Toronto - Port Credit Railway.

(ff) Toronto & Eastern Railway.

(gg) Hamilton, Galt, Elmira & Guelph Railway.

(hh) Hamilton, Brantford, Woodstock & London Railway.

(ii) St. Catharines & Niagara Falls Railway.

(jj) Niagara, St. Catharines & Toronto Railway, including Toronto Suburban Railway.

(kk) Guelph Railway

2 DEVELOPMENT OF HYDRO-ELECTRIC POWER COMMISSION

Political,

Statutory,

Financial

Commercial

3 PRESENT ORGANIZATION OF HYDRO-ELECTRIC POWER COM.

Executive Officers,

Engineering Department,

Accounting Department

Treasurer's Department,

Secretarial and Legal Department,

Inspection Department and Laboratory,

Merchandising,

Insurance; Salaries.

4 POWERS OF HYDRO-ELECTRIC POWER COMMISSION

As Trustee,

As Owner,

As a Judicial Body.

5 ACTIVITIES AND FUNCTIONS OF H. E. P. C.

Transmission of Power,

Generating of Power,

Construction of Transmission Lines,

Construction of Generating Plants,

Inspection ,

Merchandising of Supplies,

Hydrographic Surveys

Advising Municipalities on Water Supply,

Trustee for Municipalities,

Wholesaler of Power

Retailer of Power

Owner of Works and Transmission Lines,

Holding Stock in Companies,

Operating Railways

Operating Gas Plants,

Operating Pulp Mill,

Operating Farms,

Promoting Railways

Controlling Rates:
of Municipalities
of Private Companies.

5 10 15 20

6 RELATION OF H. E. P. C. TO GOVERNMENT

Powers of Commission,

Relation to Executive Council:
-In Law
-In Practice,

Fiscal Relation,

Responsibility for Expenditure:
-To the Government
-To the Municipalities,

Authorization of Expenditure:
-Exceeding appropriations
-Ear-marking appropriations,

Methods of Check and Control,

Relations of Auditors to:
(a) The Government
(b) The Commission
(c) The Municipalities,

Comptroller.

7 RELATION OF H.E.P.C. TO MUNICIPALITIES

Representation on Commission,

Representatuon in Legislature,

Ontario Municipal Electric Association,

Ontario Radial Association,

Propaganda

Position as Trustee,

Control of Expenditures,

Control of Rates,

Auditing of Accounts

Control of Financial Policy:
- -Sinking Funds
- -Reserve for Renewals
- -Deferring Operating Charges.

B [redacted]

G ACCOUNTING

21st June, 1922.

The Organization Chart herewith attached is submitted as representing in a graphical way the procedure to be followed in order that the various branches of the work may be co-ordinate and the general office work administered. The Chart is prepared as representing the directions given by the Commissioners in their executive session June 20th, 1922.

In observing the Chart it will be noted:-

(A) That in general the Commission will act as one body - looking to and holding the Secretary responsible for:-

(1) All matters of General Administration.

(2) Consultation and co-operation with the various expert branches employed by the Commission and from them to obtain or have submitted all information and data necessary to complete the various questions arising out of the Commission's investigations or matters contingent thereto.

(B) That the Chart provides for the necessary direct personal communication between the Commissioners and the various expert branches employed but it is intended that in accordance with section A, para.2 of this memoranda that all such information or data arising out of such communications in so far as it affects the work entertained in the official investigation, will be available in order that the intention of section A para.2 may be readily fulfilled

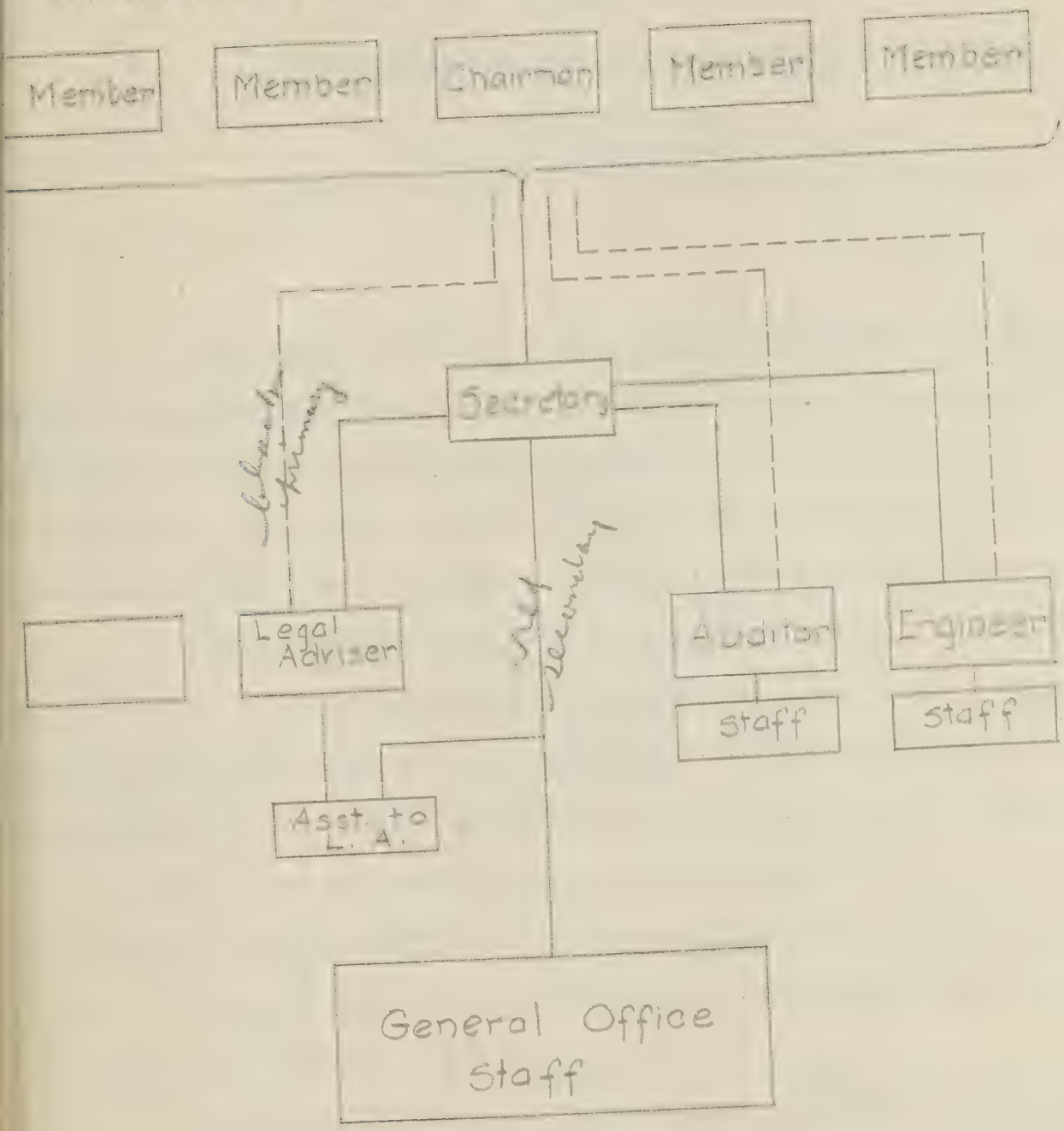
21st June, 1922.

Respectfully submitted,

JNWB/HBP.

Secretary

HYDRO-ELECTRIC INQUIRY COMMISSION



THE QUEENSTON-CHIPPAWA POWER DEVELOPMENT

of the

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

By T. H. Hogg,
Assistant Hydraulic Engineer,
Hydro-Electric Power Commission of Ontario.

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True conservation in the use of the waters of the Niagara River for power purposes demands that practically the whole fall of approximately 327 feet between Lake Erie and Lake Ontario be utilized. The various power plants now operating at Niagara vary in head from 130 feet to 210 feet, and with widely different degrees of efficiency.

The Queenston-Chippawa Power Development, the first unit of which was placed in service on December 28th, 1921, will have a normal operating head of 305 feet when the installation is complete. The conservation of head effected by the reduction of hydraulic losses to a minimum, and by refinements in the design of the various essential elements of the project as a whole, has resulted in the production of a power development which is believed to represent the best in modern hydraulic engineering practice.

The plant will have an ultimate capacity of 550,000 horse power, of which two units of 55,000 horse power capacity each are now operating, while three others of the same size are being installed. Four units of still greater capacity will be necessary to complete the installation.

It is impossible within the limited scope of this description to do more than touch on the salient points of the scheme of development and to endeavor to bring out those features that are

ique and that seem to indicate a forward step in the application of dern engineering practice to the rational and empirical elements of iraulic science.

A glance at the accompanying map will indicate the re-tion of the various works comprising the development. Water is taken om the Niagara River about one mile above the Falls, is conveyed through e improved section of the Welland River a distance of 4½ miles, thence a canal, 8½ miles long to the forebay and screen house located on the agara River, about one mile south of the village of Queenston. From e screen house, steel penstocks encased in concrete, carry the water wn the cliff to the power house.

INTAKE

Modern power development, with its attendant transmission id distribution systems, supplying all the manifold activities of gricultural and manufacturing communities throughout a great area of ickly populated country, demands continuity of service. At Niagara alls one of the great obstacles to securing this end is the annual ormation and flow of ice. Great fields of ice, formed in Lake Erie ith its shallow bays and shores, are discharged down the Niagara river very spring, and at frequent intervals during the winter, under the roper coincident wind and temperature conditions. The river itself evelops considerable anchor and frazil ice at times of low temperature, ince it never freezes over.

The site of the intake of the Queenston-Chippawa Power evelopment, at the mouth of the Welland River is favourable in that loating ice in the Niagara River does not ordinarily follow the shore ines at this point; but the smooth gradient of the river surface, and

he comparatively shall water with its low velocity is unfavorable.

The removal of water in large quantities from a river eavily charged with ice is always a difficult problem; but it is much simplified when a natural break in the river surface, accompanied by a sudden drop, gives a source of power for the separation of floating ice, nd for its continuous disposal. The use of a horizontal diaphragm, o skin the surface water with its burden of ice from the lower strata, hus permitting the upper layer to be accelerated and removed clear of he intake, without objectionable eddies, while the lower layer clear of all ice is changed in direction and flows through the intake into its new channel, givesa positive and satisfactory solution.

When the natural conditions do not permit such an arrangement as in the present case, radically different measures must be taken. To confirm certain ideas developed as a result of many years' experience and observation of the Commission's engineers, on the present plants operating at Niagara, an extended series of tests and experiments on large-sized models were made, these models duplicating to scale the topographical conditions existing at the site of the intake. The result of these experiments contributed to the preparations of a design, which, it is confidently expected, will operate in such a way as to keep the plant wholly free of this ice menace.

The fundamental ideas which were kept in mind as a guide towards a correct design may be enumerated as follows:-

1 - The natural flow of the river to be disturbed as little as possible, by diverting out of its regular course only the quantity to be removed through the intake.

2 - The intake water to be removed from the bottom of the river into subteranmean channels, where this diverted water may be handled without affecting, or being affected by the natural flow of the remainder of the water.

3 - The Intake structure to intercept a much greater width of the river bottom than that which bounds a cross-sectional natural flow equal to the amount to be diverted.

4 - The entrance velocity to the intercepting channels to be kept very low, as compared with velocities at other points in the intake system.

5 - The intake water to be diverted at all points in such a way as to be a definite and constant proportion of that rejected, for any fixed volume of diversion.

6 - Two separate intakes to be provided, each complete of itself, one of them adhering to the principles enumerated above, the other being supplementary and having characteristics widely different from the more elaborate design.

The above principles have governed the design of the struc-
s that go to form the intake proper and have necessitated the develop-
of a completely new theory of flow, to permit of producing a diversion
ater out of a main body into a traversing tube, at a uniform rate with
ect to distance measured along the tube. This theory has made poss-
the development of a rational design.

The drawings of the intake show clearly the physical nature
he structure. The complete intake structure is approximately 1,100
in length and is made up of an entrance for shipping with lock gates,
ilkhead section, and the intake proper, the latter combining the two
s of intake referred to under Item 6 above. The conventional or
face intake consists of a concrete barrier or boom with fifteen openings
18 feet in width, normally having eight feet of submergence, which
nergence can be increased, however, by means of drop gates, to any
unt up to the full depth of water or 35 feet.

The gathering tubes or draft distributors which form the
merged intake are six in number and are 675 feet in length. Water
ers the tubes along a distance of 500 feet through a slot on their
tream sides. These tubes are controlled by gates similar to those

he surface intake, and comprise an outer tapering section, wherein velocity is maintained constant, with a longer inner section of twenty diameter, wherein the velocity regularly increases with respect to ance along its axis. Diffuser sections are situated at the inner to reduce the velocity to that existing in the Welland River section as little loss as possible.

The slot on the upstream side of the tubes varies in width one foot at the shore end to four feet at the outer end, where the ends. A restricted section, shaped somewhat like a bathtub, forms uthpiece for each tube, its function being to give the required initial lse to the sucking slot.

The head at any point on the tube, causing flow through the , is the resultant of three components, (a) the initial loss due to primer, (b) the total of the induced losses due to the increments of lar flow through the slot, and (c) the total cumulative friction loss in the tube, including velocity head.

The designed rate of total inflow through each slot is 00 cubic feet per second along the axis of the tube. The rate of in- per running foot of slot has not been chosen uniform, however, be- se the river naturally feeds more water at the outer end of the tubes nearer the shore. This variation has been chosen in the ratio of r at the outer end to three at the inner end of the slot, which agrees the natural flow distribution under present river conditions. The al head loss in each gathering tube to the end of the diffuser, with low of 2500 cu. ft. per sec. in each tube, will only be three-tenths a foot.

During the greater part of the year, when no ice is running the river, the intake gates of both surface and submerged intakes will open. The navigation channel will also be open and the velocity through intake at any point will therefore, be very low, so that the head loss

er ordinary conditions will be negligible.

THE CANAL

For a great many miles above its mouth the Welland River a sluggish stream, meandering slightly in a depression that can hardly called a valley. This stream for four and a half miles forms the rst reach of the canal, and its low banks provided a suitable disposal ea for much of the material excavated in the process of straightening i deepening the channel. The radius of curvature of some of the bends increased in the new alignment, but in the main the old channel loca-on is followed. The velocity under full load conditions will be low, ing limited by the scoring velocity for the clay soil through which the proved channel is cut. The canal leaves the river channel near the ossing of the Michigan Central Railway and turning through a deflection 28 degrees takes a course almost due north for over three miles. The round surface rises fairly uniformly until the crossing of Lundy's Lane reached. The elevation here is over 660 feet above sea-level or 100 eet above the water surface at the intake. The earth over-burden is uite heavy for the whole of this portion of the canal, the bottom grade f the canal cutting the rock surface one mile from the Welland River. he maximum rock elevation of 604 is beyond Lundy's Lane and therefore ot coincident with the maximum earth surface elevation but the profiles f rock and earth surface are roughly parallel to each other. Just eyond Lundy's Lane there is the maximum bend with a deflection of 51 egress, and at intervals of a little over a mile each, two other bends f 27 and 31 degrees. The earth over-burden continues fairly uniform for three miles beyond Lundy's Lane until Bowman's Ravine is reached. ere, both rock and earth surfaces fall sharply to an elevation far below the grade of the finished canal. This ravine is apparently an old river

[illegible]

[illegible]

[illegible] for a great many miles above its mouth the Ballard River [illegible] extreme, meandering sluggishly in a depression [illegible] called a valley. This stream for four and a half miles [illegible] the canal, and the low banks provided a [illegible] for the material excavated in the process of [illegible] the canal. The radius of curvature of some of the [illegible] in the new alignment, but in the main the old channel [illegible] followed. The velocity under full load conditions [illegible] by the scouring velocity for one day with [illegible] channel is out. The canal leaves the River [illegible] of the Ballard Locks, Railway and bridge, [illegible] surface rises sharply until the crest of Ranger's [illegible]. The plane in here is over 100 feet above pool-level [illegible] Lake Washington at the lockage. The earth [illegible] the whole of this portion of the canal, the bottom [illegible] cutting the rock surface one mile from the Ballard [illegible] rock excavation of 1.4 is upon Ranger's [illegible] with the maximum earth surface excavation but the [illegible] and earth surface are roughly parallel to each other. [illegible] Ranger's Lake there is the maximum hard rock [illegible] [illegible] at intervals of a little over a mile each, the [illegible] to Lake Union. The earth over-burden [illegible] Ranger's Lake until Fremont's Bridge is reached, [illegible] and earth surface that slowly to an elevation [illegible] of the Lake Union canal. This radius is approximately [illegible]

nnel through which the Niagara River in pre-glacial times flowed to-
i Lake Ontario. At the time that construction started this was the
rse of a small stream having its outlet at the Whirlpool. The ravine
ssing is made on a fill and the ravine itself proved a convenient dis-
al area for about 1,500,000 cubic yards of excavated material.

Where the canal section again enters the rock cutting beyond
ravine, the earth over-burden becomes very light, in some places
unting to only a foot or so. Two deflections are made in the remain-
two miles of the canal, one of 33 and one of 47 degrees. A quarter
e beyond the second of these curves the forebay is reached.

Design of the Earth and Rock Sections:

As planned originally, the earth section of the canal from
point of departure from the Welland River to the beginning of the
ck cut at about station 60 was to be a trapezoidal dry excavation and
ncrete lined. Economic studies were made similar to those outlined
low for the rock section but the cross section was later enlarged and
e concrete lining replaced by rip-rap paving. It became evident
te in 1920 that in order to have the work completed in time extra equip-
nt would be required and a second change was made in the design. A
rge suction dredge in use for the Toronto harbor improvements was ob-
ined, taken to the job and, after effecting the necessary deepening of
e Welland River to give sufficient draft for itself, started work on
e earth division at Montrose and worked downstream therein for about a
le. The channel excavated is similar in size and shape to the proposed
annel in the Welland River section, a non-scoring velocity being the
miting factor.

Long continued investigations were made of available informa-
on on roughness factors for large canals in earth and rock with and

ıt concrete lining. One of the conclusions reached was that Cutter's ıa should be used. The roughness factors used in the hydraulic studies .035 for the river section and .012 for the concrete lined rock sec- In fact, very complete studies of water surface slopes were made for ıess factors of .014, .013, .012, and .011 in the concrete lined rock ɔn, the last of these being made in connection with the study of surges ɔt in anticipation of as low a factor. As the concrete lining does n all cases extend to the water surface and the flow at periods of al loads will therefore be disturbed by the rough surface of the rock the lining, these factors were modified throughout the hydraulic stud- ɔ take into account the relative perimeter of concrete lining and rough with which the water is in contact.

Forty-eight hundred feet from the Welland River the rock sur- cuts the bottom grade of the canal. The shape and size of the channel s to change here, a transition to the rectangular cross-section of the section taking place.

A thorough study of excavating machinery and methods that was ed on in 1916 and 1917 indicated the economy of using heavy equipment le of loading the spoil from the bottom of the cut on cars at the sur- A cut at least 48 feet in width was necessary to permit these large ls to work and economy studies indicated that the saving effected by ıarge shovels would compensate for any other losses that the wide cut ɜioned. From the hydraulic standpoint, for the canal capacity at first ɔsed, a cut less than 48 feet wide would have been more economical as rds quantity of excavation.

omy Studies:

Studies were made of economic depth and velocity in the canal the assumption of the 48 foot width and of the value of lining with ɔrete. These economic studies established the elevation of the ɔom, and a bottom slope of .0002113.

Assuming that the bottom of the canal is a plane surface n end to end changes in slope within quite wide limits do not materially ect the carrying capacity of the canal if the average elevation of the tom is kept constant. Thus, choosing a transverse axis at the middle the canal and rotating the bottom about this axis the slope is changed the elevation of the bottom at the middle measuring, lengthwise of the al, is constant. For a change in capacity the only alteration necess-, therefore, is a change in the bottom elevation.

The procedure in determining the economic proportions of the nal will be outlined briefly. It is desirable that the canal should rry full quantity of water required under the lowest conditions of water vel in the Niagara River. A series of canals was designed each of 48 et width and capable of carrying the required supply of water with un-orm flow and with low water in the Niagara River at Chippawa. The rst of the series was of such a depth that the velocity would be four et per second and the designed slope of bottom and water surface was e requisite slope for uniform flow, the others being designed for higher locities.

The cost of each of these canals was figured and a curve otted between low water velocity and cost. From this curve the tangents ere scaled for various low water velocities. For low velocity the canals ill be deep and therefore costly. For very high velocities the canals ill be shallow but the slope so steep that the cost will be greater than or moderate velocities, the canal of minimum cost being for a velocity ntermediate to the greatest and least investigated. The canal of min-mum cost is however, not necessarily the most economical. Enlargements ill reduce the friction loss and consequently increase the head and ower output at a cost which up to a certain point is both justifiable

l economic. The determination of the economic size is based not on r water but on the mean water conditions. For each of the canals ready designed, the profile of the water surface corresponding with an water level in the Niagara River is computed, thus determining the iction loss and lost power at mean water. Tangents were scaled from lost power curve plotted from these results and were divided into the ngents from the lost power curves for each low water velocity. The vidend in each case is the cost in dollars per horse power of the power in at the particular velocity to which the result applies. These dividends are now plotted against low water velocity, constituting an "Economy Curve" from which the economic velocity may be selected.

Slight changes in the head give increases in power without preciable change in operating or maintenance costs, and the only essenal charge against power gained by slight enlargements of the canal is e interest charge on the cost of enlargement. The economic velocity, erefore, is one corresponding with the total cost per horse power on e economy curve considerably higher than the total average cost of the ole development.

ofile of Water Surface:

As the numerous economic and hydraulic studies of the canal volve computation of water surface profiles for non-uniform flow, and planation of the method used may be of interest.

Starting with a depth somewhat less than in the part of the nnel being investigated, small constant increases in depth are assumed f such a magnitude that the flow may be considered uniform. The length f each of these short pieces of channel, in which these depth charges re assumed will vary as we move along the channel, but this variation ill be perfectly regular so that if the length of three or four of the eaches is computed, a curve may be plotted between depth of channel and

gth for a change in depth of the selected amount. This curve con-
ns all the information necessary to find the profile of the channel.

An example in figure 1 shows the various steps in this
culation. In this case, knowing that the depth at station 65 in the
k section of the canal is 32.711 feet the depth at station 200 is to
obtained for a flow of 13,000 cubic feet per second. A change in the
th in the successive sections of 0.1 feet is chosen. Starting with
lepth of 32.5 feet the length of channel for an increase in depth of
s amount is computed for depths of 32.5, 33.0, 33.5 and 34.5 feet.
formula for "L" given on the right of the table in the figure is
sed on Bernoulli's theorem.

Below the table is the curve referred to above. On it
r a depth of 32.7 feet the length of section for an increase in depth
0.1 feet is seen to be 1872 feet. Proportionately, then, for a
ange in depth from 32.711 which is the depth at station 65, to a depth
32.8 feet the distance will be 1666 feet. Lengths are scaled on the
rve for successive increases in depth of 0.1 feet until their total is
,500 feet which is the distance to station 200. As indicated in the
lculation below the curve, the depth at station 200 is 33.451 feet.
is obvious that the depth for any station intermediate to stations 65
d 200 may also be found and the profile of water surface plotted if
esired.

ontrol Works:

A control gate is located at station 97+00 which is near
he beginning of the rock section. This is a Stoney sluice of 48 feet
lear span, the full width of the rock section. The use of two gates
ith a central pier was considered, but the single gate was found to be
he most advantageous, as it provided an unobstructed waterway, with a

ıisequent reduction in friction losses. The gate, which is supported steel towers with a concrete substructure, weighs approximately 100 ıs, and is provided with two hoisting mechanisms and two counterweights. e gate when at the top of its run is sufficiently above the water sur- ce in the canal to permit a tug to pass beneath.

irlpool Section:-

Bowman's Ravine west of the whirlpool was crossed on a rock ll, the cross section of the canal being changed from a 48 foot rectang- ar section to a trapezoidal section with 10 foot bottom width and side opes of one and one half to one. This cross section was designed to as large as the rock section at the extreme minimum water level at ich operation of the generating station could take place, and, of course, e trapezoidal shape gives it greater area than the rectangular for any ter surface elevation greater than this. The whirlpool section is ned with concrete, carrying considerable reinforcement to protect the ning, in the event of settlement of the fill. It was also anticipated at should the canal be emptied at any future time, this lining would t withstand the inward pressure of the inward pressure of the water ith which the supporting rock fill would be saturated, and vents, of ıfficient size to drain the fill as quickly as the water could be drawn wn in the canal, were provided near the top and bottom of the channel. hese vents are protected with light wooden covers,which will be dislodged nder a comparatively small excess of inward pressure.

The change in the cross section from, and to, the rectang- lar shape is effected in two transitions so designed as to eliminate, as ar as possible, any hydraulic losses. In the upstream transition, nder normal conditions, the velocity of the water is being reduced.

flare in the walls is therefore much more gradual than in the down-
am transition, where the velocity is normally being accelerated. The
itions designed for are analogous to the conditions in a Venturi water
r, where it is customary to use a much sharper cone upstream, than
stream, from the throat.

There are two transitions in addition to those at the whirl-
. The first, where the earth section joins the rock section at sta-
60, involves no particular difficulty in design as the water is being
ded up. The second is at the junction of the rock section and the
bay, and of this more will be said later.

s:

Deflections in the alignment of the canal occur at six places,
of these being in the earth section, and five in the rock section of
canal, the deflection angles varying from 27° 25' to 51° 23'. A
ematical investigation was made of the curves in the rock section to
rmine the most desirable radius of curvature. This study was supplem-
d by a series of experiments on a model of one of the curves at the
aulic Laboratory of the University of Toronto.

It appeared to be established, as a result of these tests,
a bend of short radius should be used, shorter, in fact, than the
cted radius of 300 feet. This figure was fixed, however, as it was
shortest around which the shovels could work and load cars at the top
he cut.

The radius of curvature, furthermore, is 300 feet for inner
outer sides and centre line, the channel thus being slightly wider at
bends than on tangents.

rete Lining:

Economic considerations prompted the lining of the canal with
rete. The height of the lining was fixed slightly lower than the

profile of the water surface existing when the load conditions on the plant are a maximum and the Niagara River flow is a minimum. Thus, at all times the lining will be protected by submergence against the action of frost.

The thickness of the lining varied with the rock over-break but averaged about 20 inches, and where necessary, steel dowels were used to anchor the concrete lining to the rock face.

It was held that extreme smoothness of surface was not the only determining factor, but that precise alignment is also a most important element in the reduction of hydraulic losses. Great care was taken to obtain a smooth surface by the use of steel forms and a positive and rigid method of form setting was devised, which ensured almost perfect alignment. The results obtained were very excellent, and it is expected, when opportunity offers to experimentally test the efficiency of lined section of the waterway, that extremely low roughness factors will be realized.

The Forebay:

The kinetic energy of the water at the end of the canal, and at entrance to the forebay, was too great to neglect in the design. Necessarily, in the forebay, the velocity of the water will be so greatly reduced as to make its velocity head negligible, and some means had therefore, to be found to regain the energy in the water as its velocity decreased. The same difficulty is experienced here as in any transition in which velocity is being reduced; namely, that the stream lines tend to follow paths of their own course, unless the design is very carefully worked out and the angle of divergence properly fixed.

A great mass of experimental data on diverging tubes for air and water is available, indicating that a ten degree angle of flare

is the most efficient. In order to confirm, for this particular case, the conclusions arrived at from other experiments, a model of the forebay was built in the Hydraulic Laboratory of the University of Toronto, and tried out with 19 transitions of various angles and lengths. These experiments confirmed the conclusions reached from other available data, and also provided, in their quantitative results, a basis for the economic design of a transition that would cost no more than was justified by the gain in power from reclaimed head. These experiments involved measurements of extremely small differences of water level, necessitating observations to thousandths of an inch as the velocities in the model were quite low, - only one-twelfth of the corresponding velocity in the full size structure. Notwithstanding this condition, the results were, with very few exceptions, quite consistent, and resulted in the design of the "diffuser" structure inserted in the forebay transition, providing two entrance passages into the forebay, each with a diverging angle of ten degrees. This structure is built of concrete with very little reinforcement, and will at all times be completely submerged so as to afford no obstruction to the flow of ice on the surface. It consists of a wedge-shaped structure 221 feet long and 37 feet wide at the downstream end. The sides are vertical, straight and smooth and are carried 28 feet above the bottom of the forebay. There is no roof but the side walls are tied together by seven beams, one of which forms a part of the end wall. An opening 16 feet by 20 feet in the end wall assures approximately equal pressures on both sides of the walls. The top of the diffuser is at the same elevation as the bottom of the curtain wall at the screen house and therefore, below the lowest water level in the forebay.

Through this expedient, the high velocity at the end of the canal is gradually reduced and its kinetic energy recoved, with the result that the elevation of the water in the forebay beyond the deflector

be higher than at the mouth of the canal. For a flow of 15,000 feet per second, and mean water level at Chippawa, the reclaimed amounts to approximately one foot.

s:

In the event of a sudden shut-down of the power house, the level in the forebay may rise considerably above the level in the ra River at Chippawa. Investigation of the magnitude of the surge d that a maximum water level in the forebay of about elevation 570 e reached under certain conditions of rejected load, and the forebay screen house were therefore designed to stand this water level. llway, 300 feet long with crest at elevation 564, is provided on the side of the forebay, which will reduce the maximum surge somewhat effect a return to normal conditions in the forebay sooner than would rwise be the case.

SCREEN HOUSE.

At the lower end of the forebay, and serving as a dam for same, is located the screen house. This structure forms the entrance, the control for, the penstocks. The entrance to each of the main tocks is a modified bell-mouth consisting of three openings 12 feet ches wide and 29 feet high at the rack supports. These three ings gradually converge into one opening 16 feet in diameter at the t of connection to the penstocks. In designing these water passages icular care was given to the securing of smooth stream lines and con- ent changes in velocity. The bell-mouth entrances are sealed by a rete curtain wall extending down to elevation 542.0 which gives a th of 28 feet above the floor of the forebay. Immediately behind the tain wall, steel lined gate checks are provided to support structural el gates. These provide a means of unwatering in case it is necess- to get at the lower sections of the racks, or for inspection of the

ocks. The dividing of the intake into three water-ways was done in that the spans for the gates could be made of convenient size and to it the use of racks of a somewhat new design. The racks, which con- of three by three-eighths bars, on edge, at five inch centres, are ened rigidly to a structural steel supporting frame held in checks in concrete walls. The whole of the rack structure is removable and are split horozontally in two sections for convenience in handling. ecially designed rack follower, with an automatic latch arrangement, rovided to facilitate the removal of the racks, the bottom section g a considerable distance below the floor of the screen house. The and the supporting structure of the racks are designed to withstand ad of 10 feet with a stress of 20,000 pounds to the square inch in the l. This type of construction removes the danger of a serious shut- due to the collapse of rack structures, as in the event of blocking ce or other form matter, the failure of one section would immediately eve the others. The broken section can then readily be replaced a spare without serious interruption to operation.

A trash trench of liberal dimensions extends across the tom of the forebay immediately in front of the screen house piers to lect any debris or form material which may travel along the bottom of forebay. The piers, dividing the main unit entrances are 6 feet in ckness, while the two intermediate piers in each unit are 3 feet thick, main dividing piers are designed for full water pressure on each side order that any unit of the intake may be unwatered while the adjacent ts are in operation. An opening in the main floor immediately behind racks provides a means of disposal of trash into a trough, which empties o the ice chute.

The screen house as constructed, provides for 9 main units, ervice unit and an ice chute, and is arranged so that a further unit

rance may be added at the north end.

The entrance to the service unit is similar to the main .t, except that it consists of one bay only, and the entrance to the ıstock itself, is a true bell-mouth instead of the sectionalized trans-.ons in the main unit entrances. The ice chute bay has a clear width 25 feet and is provided with a sluice gate of the "Stoney" type, which lowered to pass surface water carrying ice. After passing the gate, s water and ice enter a 10 feet diameter concrete pipe and passing wn the cliff, out beneath the power house, empty into the Niagara River. oplog checks are provided ahead of the gate for use in an emergency, or r inspection purposes.

The screen house is located close to the edge of the es-rpment, only a narrow ledge of rock being left between it and the gorge. ing to the disastrous results which would follow a failure, the screen use was designed to resist the full head exerted by the water in the rebay without any assistance from the adjacent rock.

PENSTOCKS

From the screen house the water is carried to the turbines ı steel plate penstocks; these are 16 feet in diameter for approximately vo-thirds of their length, and are then reduced by a taper section to diameter of 14 feet. The accompanying illustrations show the ex-ellent alignment of the penstocks, there being only two bends, one ocated at the top and one at the bottom. These elbows are held in assive concrete anchor blocks, the one at the upper bend forming a oundation for the piers supporting the sidewalk and roadway along the dge of the escarpment.

Each penstock ring is made up of two plates with longit-dinal joints on the horizontal centre line. These joints are all

ıble butt joints, varying from double rivetted at the top to quadruple ·etted at the lower end. The circumferential joints are also single .t, double rivetted with the butt strap on the outside. The longit-.nal joints are calked on the inside, but the circumferential joints : made water-tight by electric welding. This type of circumferen-ıl joint gives a very much better alignment to the inside of the pipe an can be obtained with the usual outside and inside course with lap irts. In designing the penstocks a stress of 12,000 pounds to the uare inch was used, this figure being taken to provide for the exig-cies of corrosion, fatigue and suddenly applied loads, and other in-terminate or unknown contingencies. The internal pressure, used r design purposes, was taken to be the static head, plus the pressure se due to a complete closing of the turbine gates in 1½ seconds. is increase in pressure was taken as a maximum at the turbine gates d varying uniformly to zero at the racks.

The thickness of the plates varies from one-half inch at e top section to one and one-quarter inches at the lower section, ile the longitudinal butt straps are one-half inch thick with two rows seven-eighths rivets for the lightest joint, and fifteen-sixteenths ıch with four rows of one and three-eighths inch rivets for the heaviest. ıe efficiency of the longitudinal joints at the heavy section is approx-ıately 85 per cent. In the erection of the penstock a new departure as initiated in the use of electric rivet heaters; by this method a onsistent and close range of temperatures was possible so that burnt ivets were very rarely encountered.

The penstocks are covered throughout their entire length ith a concrete envelope, having a minimum thickness of 24 inches, which rotection will, it is believed, greatly increase the life of the steel ipes.

The penstock for the service units follows the same align- as the main penstocks and has a diameter of 5 feet. As friction in this pipe was not such an important factor, lap joints and in- and outside courses were used.

The lower end of the main penstock terminates in a 14 foot ison valve, the outlet end of which is 10 feet in diameter and connects the turbine casing by several sections of cast steel pipe. While this e of valve is too well known to require any description, the method control is worthy of note. The operation of the valve is accomplished ough three 8 inch Johnson valves, and these are in turn operated by tons in cylinders under penstock pressure controlled by a 3-way plug ve. When opening the valve to fill the scroll case, it is necessary build up the pressure in the latter, in order to balance the pressure the two sides of the plunger. The operation of the valve is so anged that this is carried out automatically by a series of oscillations the plunger, as soon as the control handle has been thrown into the ning position. In closing, the motion of the plunger is retarded ar the end of the stroke to prevent an excess rise in pressure, due to sudden closing, and also to protect the plunger seat against shock. e control is so arranged that the valve will close automatically in case a break in the scroll case, and it is also provided with a remote hand ntrol so that it may be closed, if necessary, from the governor control destal on the main operating floor.

TURBINES

The first two turbines were built by the Wellman-Seaver- rgan Company of Cleveland, while the last three are being supplied by e William Cramp and Sons Ship and Engine Building Company, Philadelphia, a. The design and construction of these latter have been described n a previous paper by Mr. F. H. Rogers. The first two units have a

acity of 58,000 b.h.p. under 305 foot head and the section through the er house shows clearly the general arrangement. The diameter of the ner is 125 inches and the diameter of the shaft is 30 inches. A not- e difference in the first two units is in the draft tubes. The draft e on No. 1 unit is of the common curved type, modified at the elbow, le the second unit is equipped with a Moody spreading tube. In the de- n of these units care was taken to insure good lubrication for the gate ms and to assure that all wearing surfaces were well greased. The use labyrinth seals on the runner rims cuts down the leakage to a minimum. will be noted on the section that the top portion of the draft tubes of cast iron and these are so arranged that they can be lowered to ilitate the removal of the runner from below, thus dispensing with the essity of dismantling of the generator. Owing to the presence of con- erable sand in the water during periods of flood, and by reason of dred- g operations in the upper canal, a pressure sand filtering plant has n installed to filter all water supplied to the lignum vitae bearings prevent scoring of the turbine shaft. The lignum vitae bearings them- ves are about 6 feet in length and in order to ensure lubrication over ir entire length the water is admitted both at the middle and top of bearing. A Republic flow meter, with an indicator and an alarm light connected to the bearing water supply to guard against any stoppage of flow continuing long enough to injure the shaft or bearing.

Air brakes, which act against the underside of the generator tor, are provided to bring the unit to rest quickly, in case of shut-down.

Each main unit is provided with a control panel located on e main operating floor, on which are mounted all the instruments necess- y for the operation of the unit and the remote control for the Johnson lves.

The governor system for the main units uses filtered water, ontaining one per cent of soluble oil. This is supplied to the governor t from 150 to 200 pounds per square inch pressure from two motor driven entrifugal pumps which feed into a pressure header extending the length f the power house, and supplying an accumulator tank for each unit. The eturn fluid from the servo-motors is carried back through a return main o two concrete tanks so arranged that one tank may be emptied and leaned while the other is in operation. It had been found, in other nstallations, where a central pumping system, capable of handling the ompleted plant, was initially operated to supply only one or two units, hat difficulty was experienced owing to the large capacity pumps heating p the small amount of fluid in circulation. To avoid this, a small apacity pump was also installed to supply governor pressure during the arly stages of operation, and to be afterwards held in reserve for an mergency. To guard against a shut-down due to the failure of the overnor pumps, an emergency connection has been provided to pass direct enstock pressure into the governor system header. This permits the overnors to operate on penstock pressure, at any time that the pumping ystem is out of service, and has already been called into service since the first two units were placed in operation.

Owing to the very small ratio of length of penstock to head (about 1-1/4:1) and the large fly wheel effect of the generator rotors, the regulation of these units is a comparatively simple problem.

At the south end of the power house there are installed two service units to supply power for the operation of the various services in connection with the generating station. The arrangements of these units is clearly illustrated in the plan and section of the power house. The water for these units is supplied by a 5 foot diameter penstock which is split just before it reaches the units into two 30 inch diameter

ns, each of which is controlled by a Johnson valve. These units ıted at 2800 H.P. each at 500 R.P.M. under 305 feet head and are ; connected to alternating current generators. These units which built by the Canadian Allis-Chalmers Company are single runner, vert- shaft type with cast iron scroll cases. The governors, governor , etc., are entirely independent of the main governor system. Oil ed as a medium in these governors, and is supplied by two-gear pumps motors mounted on the same base as the pressure tank. The governors f the new Allis-Chalmers type with fly-balls mounted on the turbine and the units are equipped with friction brakes to assist in bringing nits to rest when required.

POWER HOUSE

The repair shops, store rooms and operators' quarters are sit- i at the north end of the power house. The floor in the generator section of this portion of the building is at elevation 284, which is level of the main generator bases. This is the operating floor for the ice unit generators and also provides erecting space for the assembly epair of large pieces of the apparatus. In the space immediately below section is installed the main lubricating system. The outlet for the chute from the forebay is also under this portion of the building. The tion floor is provided with a pedestal for supporting the generator r, while the floor itself is of heavy construction being designed for iiformly distributed load of 1,000 pounds per square foot. Openings provided in this floor and the floor below, so that it is possible for cranes to lower runners or other spare equipment to the runner tunnel, ated at elevation 242.0, which tunnel gives access to the underside of turbine casings of each of the main units. Below the runner tunnel

[illegible], each is rated in horsepower units. These units [illegible] 1,[illegible] each at 500 R.P.M. under 325 feet head and are [illegible] to alternating current generators. These units which [illegible] the Canadian Allis-Chalmers Company are single runner, vertical [illegible] with cast iron scroll cases. The governors, governing [illegible], are entirely independent of the main governor equipment. Oil is used as a medium in these governors, and is supplied by two-gear pumps mounted on the same base as the pressure tank. The governors are the Allis-Chalmers type with flyballs mounted on the turbine shaft. The units are equipped with friction brakes to assist in bringing the units to rest when required.

POWER ROOMS

The rooms above, where rooms and generators' machinery are located, are south end of the power house. The floor in the generator section of this portion of the building is at elevation [illegible], which is the tail generator beam. This is the operating floor for the main generators and also provides crawling space for the assembly of large pieces of the apparatus. In the space immediately below the floor is installed the main lubricating system. The main for the floor and foreboy is also under this portion of the building. The floor is provided with a pedestal for supporting the generator while the floor itself is of heavy construction being designed for a distributed load of 1,000 pounds per square foot. Clearance in this floor and the floor below, so that it is possible for a lower runners or other engine equipment to the runner runner, is allowing 248.0, which tunnel gives access to the underside of the units at each of the main units. Below the runner tunnel

re is a small tunnel extending the full length of the power house which ects all the drainage and carries it to a sump located at the south end; which point, it is pumped into the river. Two pumps for handling this er are installed, one 12" horizontal pump located on the floor at eleva- 243.0 and an 18" vertical shaft pump, the motor for which is located the floor at elevation 284.0 to ensure operation in case of the flooding the lower levels of the power house. The possibility of a rise in the er level causing a serious flooding of the power house was kept constant- in mind by the knowledge of the disastrous experience of the Ontario er Company in 1909. To prevent such an occurrence, the walls of the er house were designed to resist water pressure up to elevation 300.0 and openings which might admit water from the river were permitted below this el.

In the cross section through the power house there will be ed a large tunnel immediately above the penstocks and west of the valves. s tunnel extends the full length of the power house and contains the er service piping for the generating station. This supply is drawn m the penstocks each of which feeds into a main service header. This der has connections to supply the generator bearings, transformers, and ters for the turbine bearings, as well as all other requirements. This nel which is known as the west piping tunnel, also contains the main oil ply pipes and this concentrates most of the auxiliary piping in one sec- n of the building.

The power house substructure is of massive proportions with vy arch construction or passage-ways, tunnels or other openings where hes were possible. Very heavy reinforced construction was necessary some instances, and in passing, one of these may be noted. The Moody ft tubes have a maximum diameter at the bottom of forty-two feet. It

necessary to span this distance with a concrete slab on which very heavy ds are imposed. These loads include, among others, the weight of the crete above, the weight of the turbine casing filled with water, and a tion of the generator and main column loads, which are assumed to be ead uniformly over the substructure at the elevation of this slab. The al of the loads assumed to come on this structure amount to 7600 pounds square foot and the slab which is 9 feet in thickness, was designed as lat disk with reinforcing in four directions, in order to clear the draft e opening in the centre.

To facilitate the handling of equipment the power house is ipped with two 150 tons electrically operated cranes, which, by means of equalizer yoke, can make a combined lift of 300 tons, enabling them to dle a complete generator rotor.

To permit of ready access to the power house from the main dway and the electric railway on the top of the cliff, an elevator is pro- ed in the south end of the screen house, connecting with the power house means of a tunnel. The south end of the screen house will provide an rance to, and administration offices, for, the completed plant.

Throughout the period of preliminary study of the development later as the design progressed, continuous use was made of models of the ious structures in order that the mathematical analysis might be reinforced actual demonstrations of the action of water under the assumed conditions. h model tests were made for the studies of the intake, the bends in the al, the transitions, the diffuser at the mouth of the forebay, and on the ft tubes. It is believed that the beneficial result of such studies of the care taken in the design of what are often considered minor elem- s of apower development will be demonstrated when complete test results available.

Such tests as have already been made indicate conclusively that least as high an over-all efficiency from head water to tailwater has been

secured, as has ever before been obtained.

This discussion would not be complete without a reference to the connection of Mr. R.D.Johnson with the design. Mr. Johnson was closely associated with the Hydraulic Department staff of the Commission, throughout the period of the work, and reported among other things upon the intake, the design of the canal, with its transitions and bends, and the surges to be expected under operating conditions. The theories of flow used for the design of the intake, and for the computations of surges in the canal, are some of his outstanding contributions on hydraulic research, which have been made available by reason of this association.